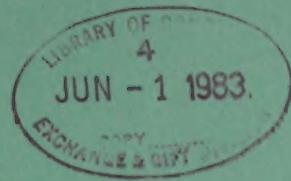


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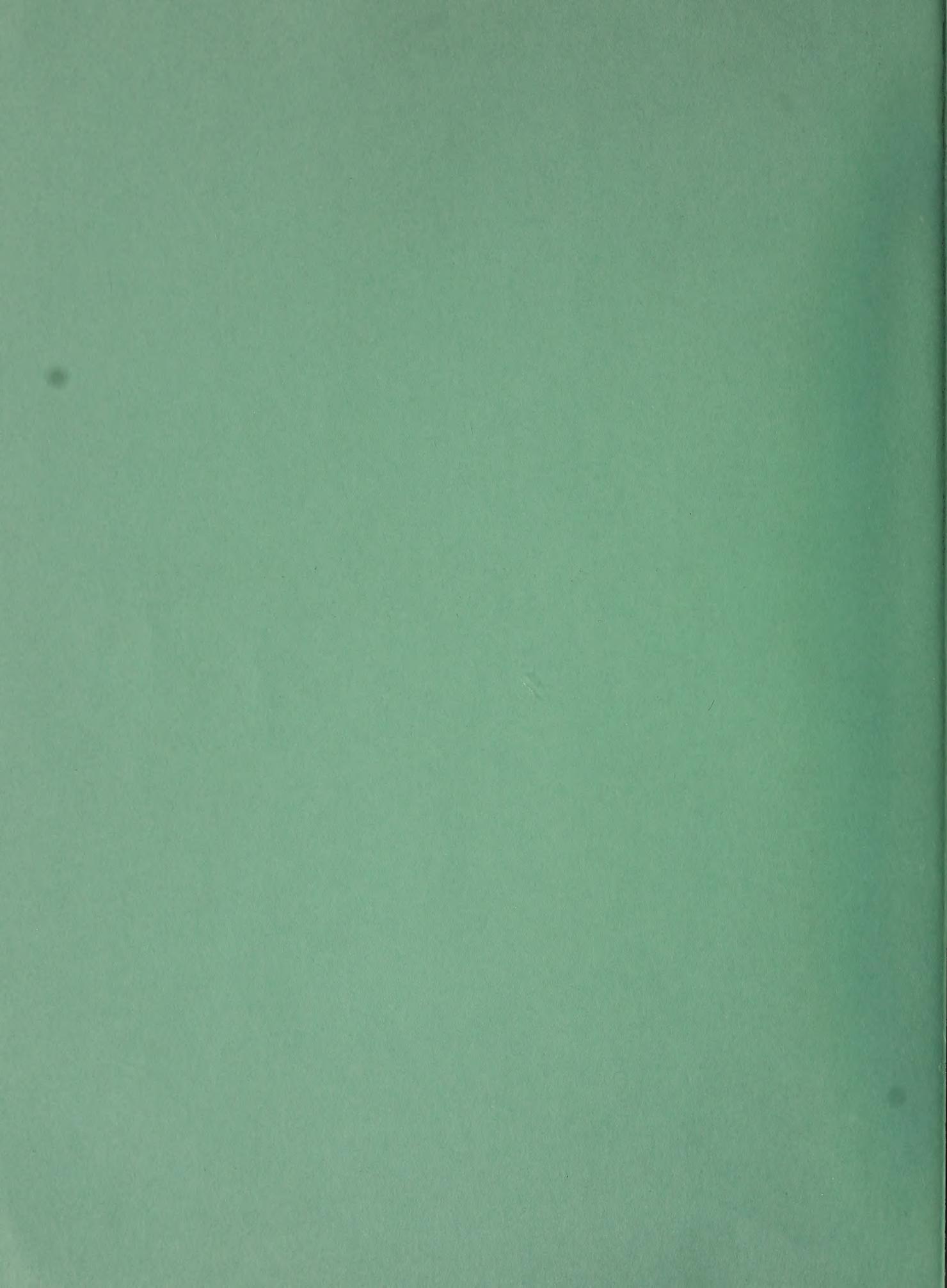


## **Minerals Availability Commodity Directory on Phosphate**

**By Dale R. Spangenberg, Edward F. Carey,  
and Paula M. Takosky**



**UNITED STATES DEPARTMENT OF THE INTERIOR**



(United States, Bureau of Mines)

Information Circular 8926

# Minerals Availability Commodity Directory on Phosphate

By Dale R. Spangenberg, Edward F. Carey,  
and Paula M. Takosky



UNITED STATES DEPARTMENT OF THE INTERIOR

James G. Watt, Secretary

BUREAU OF MINES

Robert C. Horton, Director

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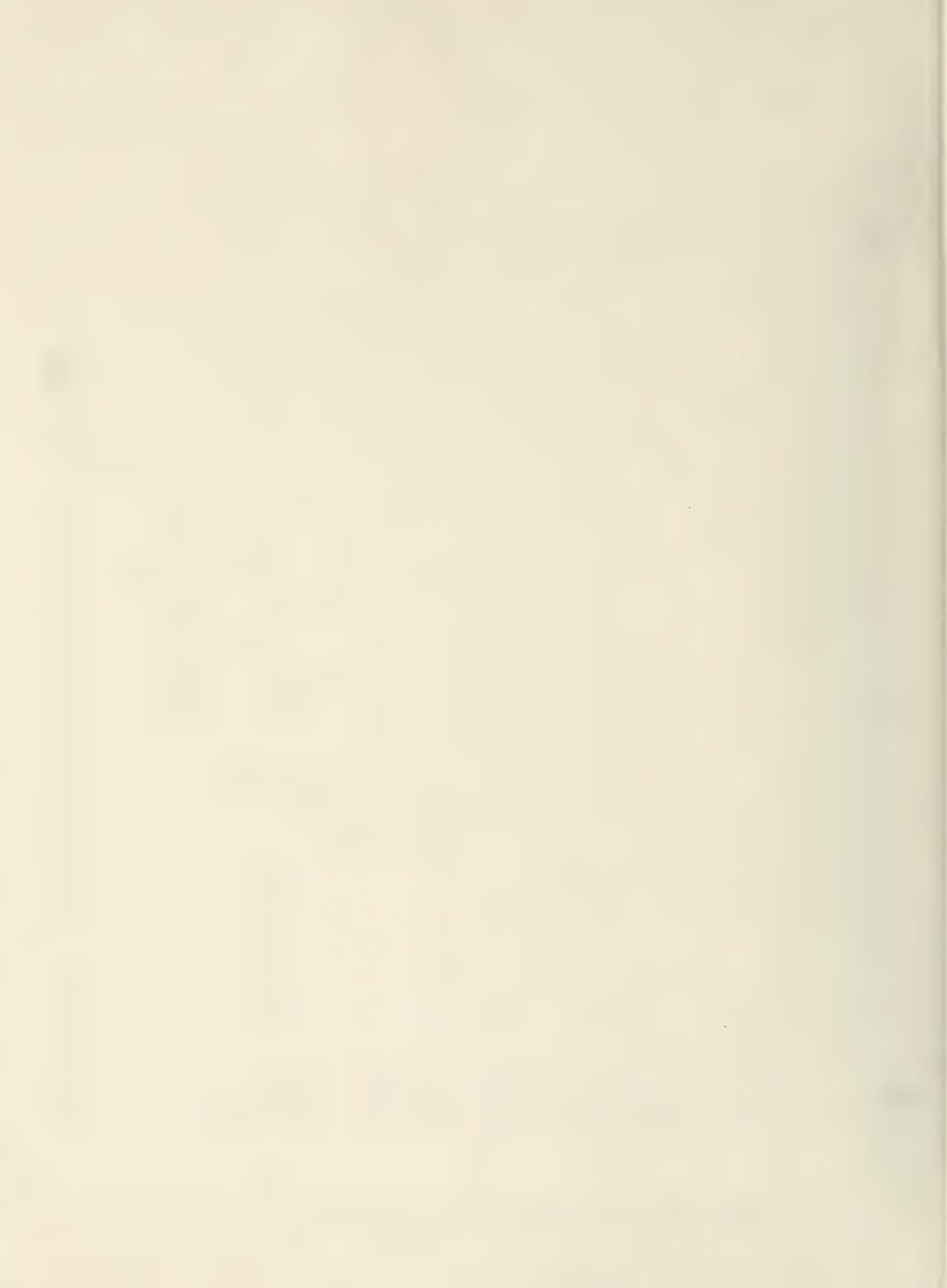
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# MINERALS AVAILABILITY COMMODITY DIRECTORY ON PHOSPHATE

By Dale R. Spangenberg,<sup>1</sup> Edward F. Carey,<sup>2</sup> and Paula M. Takosky<sup>3</sup>

## ABSTRACT

This Bureau of Mines Information Circular on phosphate is one of a series of minerals availability commodity directories. Nonconfidential information from the Minerals Availability Program data base covering 148 domestic and 103 foreign phosphate properties and deposits has been abstracted for use in this directory. Abstracts include applicable data on location, published reserves and resources, geology, mine and beneficiation systems, and operational information.

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## INTRODUCTION

This publication is one of a series of commodity directories from the Bureau of Mines Minerals Availability Program. The directory is intended to provide Government personnel and the general public with site-specific information on major identified domestic and foreign phosphate properties and deposits. It is a compilation of nonproprietary deposit information abstracted from the Minerals Availability Program data base. Included in the abstracts are locational information, published reserve and resource estimations, geological descriptions, mine and beneficiation systems, and actual or estimated operational parameters.

The Bureau of Mines Minerals Availability Program conducts engineering and economic availability appraisals of nonfuel mineral commodities. These appraisals are made after systematic resource and engineering-cost evaluations of site-specific deposits have been conducted and the data entered into the Minerals Availability Program data base. Deposits are chosen for evaluation based on their contribution or potential to significantly contribute to the overall availability of a commodity.

The reserve and resource data presented in this report are restricted to information on specific deposits, or aggregated deposits, obtained from published sources. Minerals availability assessments on reserve and resource data

often are based on information provided by mining firms as company confidential data which cannot be presented in non-aggregated form. The published data presented herein are included to provide some information on reserve and resource potentials for given deposits, or aggregated deposits. These values may not represent the most current information being utilized in the Bureau's analysis or the amount of reserve at a given property.

The comparison of reserve and resource information as presented in this report and other Minerals Availability Program reports with estimates from other sources, on either a specific property, aggregated properties, or commodity basis, may show differences in estimates. Differences may be due to variations in terminology, changes in estimates of reserve and resource data over time, and the source of the estimates. Factors affecting such changes include the number of deposits considered, changes in economic conditions, additional exploration efforts, and depletion of ore due to production. These factors may account for discrepancies in the amount of reserves and resources being compared.

Additional information on the Minerals Availability Program appears in Information Circular 8887, "The Bureau of Mines Minerals Availability System: An Update of Information Circular 8654."

## ACKNOWLEDGMENTS

Compilation of the phosphate directory was supported by the Minerals Availability Program staff at the Eastern Field Operations Center, Pittsburgh, Pa., and coordinated through the Division of Minerals Availability, Washington, D.C. The deposit evaluations included in the Minerals Availability Program data base,

from which information for this directory was abstracted, were completed by evaluators at the Eastern Field Operations Center, Pittsburgh, Pa., Intermountain Field Operations Center, Denver, Colo., Western Field Operations Center, Spokane, Wash., and Minerals Availability Field Office, Denver, Colo.

## ORGANIZATION OF DIRECTORY ABSTRACTS

The Directory is divided into domestic and foreign sections. Domestic deposits are listed alphabetically by State and county; foreign deposits are listed by country and political subdivision. Within each country or political subdivision,

deposits are listed by Minerals Availability Program sequence number.<sup>4</sup> The number of domestic deposits is summarized in table 1, and the number of foreign deposits in table 2.

TABLE 1. - State totals of domestic deposits

	<u>Number of deposits</u>		<u>Number of deposits</u>
Florida.....	97	South Carolina.....	2
Georgia.....	2	Tennessee.....	6
Idaho.....	17	Utah.....	8
Montana.....	2	Wyoming.....	10
North Carolina.....	4	Total.....	<hr/> 148

TABLE 2. - Country totals of foreign deposits

	<u>Number of deposits</u>		<u>Number of deposits</u>
Algeria.....	1	Nauru.....	1
Angola.....	1	Pakistan.....	1
Australia.....	8	Peru.....	1
Brazil.....	11	Saudi Arabia.....	2
Canada.....	1	Senegal.....	2
China.....	11	South Africa.....	1
Colombia.....	1	Syria.....	3
Egypt.....	6	Togo.....	2
Finland.....	2	Tunisia.....	7
India.....	1	Turkey.....	1
Iraq.....	1	U.S.S.R.....	13
Israel.....	4	Venezuela.....	1
Jordan.....	3	Western Sahara.....	1
Mexico.....	3	Zimbabwe.....	1
Morocco.....	12	Total.....	<hr/> 103

<sup>4</sup>The sequence number is a unique 10-digit reference number assigned to each deposit. For domestic deposits, the first three digits designate the State, the next three digits designate the county, and the last four digits designate a number unique to each deposit within that State and county. For foreign deposits, the first three digits designate the nation, the next three digits designate the political subdivision, and the last four digits designate a number unique to each deposit within that nation and political subdivision.

Each deposit abstract consists of six data sets. These are listed below in the order in which they appear within an abstract.

1. Location and general deposit information.
2. Published reserve and resource information.
3. Deposit historical information.
4. Geological and spatial characteristics of deposit.
5. Mine and mill information.
6. Bibliographic records.

Each abstract is composed of screened data elements of an individual deposit selected from the Minerals Availability Program data base. Proprietary data

elements have been omitted from this directory. Because of the limited amount of published reserve information on individual domestic phosphate deposits, aggregated reserve and resource information has been included for domestic deposits, on a broader area basis. Mine and mill operational information is included only for phosphate deposits that are currently producing or temporarily shut down. The date the information was obtained is included in each deposit abstract. Metric units are used throughout the abstract listings in this directory.

Two appendixes are included as an aid in directory use. Appendix A presents an alphabetical listing of abstracts by deposit name. Appendix B presents a listing of abstract data sets, subsets, and data elements that may appear in the abstracts; terms with usage particular to this directory are defined in brackets.

## DEPOSIT ABSTRACTS

## DOMESTIC DEPOSITS

FLORIDALOCATION AND GENERAL DEPOSIT INFORMATION

DEPCSIT NAME: PIRKLE DEPOSIT 1

SEQUENCE NUMBER: 0120010001

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: PROSPECT  
 LATITUDE: N 29 DEG 41 MIN 49 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 54 METERS  
 DATUM: SEA LEVEL

COUNTY: ALACHUA  
 CURRFNT STATUS: EXPROLED DEPOSIT  
 LONGITUDE: W 82 DEG 18 MIN 11 SEC  
 NORTHING: 3285736 EASTING: 373935  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP

OWNERSHIP  
 OWENS-ILLINGIS CORPORATION  
 CONCORA CORPORATION  
 NUMEROUS SMALL OWNERSHIPS

STATUS  
 OWNER  
 OWNER  
 OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABLITY
ALUMINUM	ALUMINA	AFFECT MARKETABLITY
MAGNESIUM	OXIDE	AFFECT MARKETABLITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR NORTHERN, EAST COAST, AND HARD ROCK DISTRICTS IN FLORIDA IS 10.507 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.46% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB286 E48/AS, 1978, 159 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE  
 YEAR OF DISCOVERY: 1956

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION: HAWTHORN FORMATION      GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLomite	CARBONATES	VARIABLE

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PIRKLE, E.C., JR. PEBBLE PHOSPHATE OF ALACHUA COUNTY, FLORIDA. PH.D. DISSERTATION, UNIVERSITY OF CINCINNATI, 1956, 203 PP.

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: LAKES DEPOSIT

SEQUENCE NUMBER: 0120010002

NATION: USA STATE: FLORIDA

COUNTY: ALACHUA

TYPE OF OPERATION: PROSPECT

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 29 DEG 40 MIN 01 SEC

LONGITUDE: W 82 DEG 04 MIN 59 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

NORTHING: 3282192 EASTING: 395189

POINT OF REFERENCE: ORE BODY

PRECISION: 500 METERS

ELEVATION: 47 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

## OWNERSHIP

OWENS-ILLINOIS, INCORPORATED  
UNIDENTIFIED OWNERS

## STATUS

OWNER  
OWNER

## COMMODITY

## MODIFIER

## MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

FLUORINE

RECOVERABLE

URANIUM

RECOVERABLE

IRON

AFFECT MARKETABILITY

ALUMINUM

AFFECT MARKETABILITY

MAGNESIUM

AFFECT MARKETABILITY

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR NORTHERN, EAST COAST, AND HARD ROCK DISTRICTS IN FLORIDA IS 10.507 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.46% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PE296 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

## -----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: HAWTHORN FORMATION      GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SIO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

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USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: LA CROSSE DEPOSIT

SEQUENCE NUMBER: 0120010003

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 29 DEG 49 MIN 59 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 40 METERS  
 DATUM: SEA LEVEL

COUNTY: ALACHUA  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 82 DEG 23 MIN 28 SEC  
 NORTHING: 3300918 EASTING: 365597  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

OWNERSHIP  
 KERR MCGEE RESOURCE CORPORATION

STATUS  
 OWNER-OPERATOR

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR NORTHERN, EAST COAST, AND HARD ROCK DISTRICTS IN FLORIDA IS 10.507 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.46% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB286 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION: HAWTHORN FORMATION      GEOLOGIC AGE: MIOCENE  
ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: NORTH BAKER COUNTY DEPOSIT SEQUENCE NUMBER: 0120030001

NATION: USA	STATE: FLORIDA	COUNTY: BAKER
TYPE OF OPERATION: PROSPECT		CURRENT STATUS: EXPLORED DEPOSIT
LATITUDE: N 30 DEG 29 MIN 01 SEC		LONGITUDE: W 82 DEG 19 MIN 59 SEC
UTM - ZONE: 17	HEMISPHERE: NORTHERN	NORTHING: 3371100 EASTING: 372028
POINT OF REFERENCE: ORE BODY		PRECISION: 500 METERS
ELEVATION: 40 METERS		PRECISION: 10 METERS
DATUM: SEA LEVEL		YEAR OF INFORMATION: 1979

## ALTERNATE NAMES

CONTINENTAL CAN DEPOSIT

## OWNERSHIP

UNITED STATES STEEL CORPORATION
CARNEGIE PENSION FUND
CONTINENTAL CAN COMPANY

## STATUS

OWNER
OWNER
OWNER

## COMMODITY

## MODIFIER

## MARKETABILITY

PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR NORTHERN, EAST COAST, AND HARD ROCK DISTRICTS IN FLORIDA IS 10.507 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.46% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB286 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

GEOLOGICAL INFERENCE

-----EXPLORATION METHODS-----  
CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: HAWTHORN FORMATION      GEOLOGIC AGE: MIOCENE

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

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ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: BROOKER-DUKES

SEQUENCE NUMBER: 0120070002

NATION: USA STATE: FLORIDA

COUNTY: BRADFORD

TYPE OF OPERATION: SURFACE

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 29 DEG 55 MIN 37 SEC

LONGITUDE: W 82 DEG 20 MIN 20 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

NORTHING: 3311263 EASTING: 370765

POINT OF REFERENCE: ORE BODY

PRECISION: 500 METERS

ELEVATION: 27 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING

PRIVATE LEASE; FEE OWNERSHIP;  
MINERALS ONLY

OWNERSHIP

KERR-MCGEE CORPORATION

STATUS

OWNER

COMMODITY

MODIFIER

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

FLUORINE

RECOVERABLE

URANIUM

RECOVERABLE

IRON

AFFECT MARKETABILITY

ALUMINUM

AFFECT MARKETABILITY

MAGNESIUM

AFFECT MARKETABILITY

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR NORTHERN, EAST COAST, AND HARD ROCK DISTRICTS IN FLORIDA IS 10.507 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.46% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB286 648/AS, 1978, 109 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

YEAR OF DISCOVERY: 1960

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED: REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION:	BONE VALLEY FORMATION	GEOLOGIC AGE:	MIocene
ROCK TYPE:			
PHOSPHORITE	IS ORE		
SAND	GANGUE		
SILT	GANGUE		
CLAY	GANGUE		
DOLOMITE	GANGUE		

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SIO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

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ZELLARS-WILLIAMS, INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286-648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: DESERET RANCH

SEQUENCE NUMBER: 0120090001

NATION: USA STATE: FLORIDA

COUNTY: BREVARD

TYPE OF OPERATION: SURFACE

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 27 DEG 56 MIN 46 SEC

LONGITUDE: W 80 DEG 50 MIN 13 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

NORTHING: 3091071 EASTING: 516040

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 7 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

## OWNERSHIP

## STATUS

MORMON CHURCH

OWNER

## COMMODITY

## MODIFIER

## MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

FLUORINE

RECOVERABLE

URANIUM

RECOVERABLE

IRON

AFFECT MARKETABILITY

ALUMINUM

AFFECT MARKETABILITY

MAGNESIUM

AFFECT MARKETABILITY

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR NORTHERN, EAST COAST, AND HARD ROCK DISTRICTS IN FLORIDA IS 10.507 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.46% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, TIS: PFD86 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

## -----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

YEAR OF DISCOVERY: 1975

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION: HAWTHORN FORMATION      GEOLOGIC AGE: MIOCENE

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: HARDROCK DEPOSIT

SEQUENCE NUMBER: 0120170001

NATION: USA STATE: FLORIDA

COUNTY: CITRUS

TYPE OF OPERATION: SURFACE

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 29 DEG 00 MIN 29 SEC

LONGITUDE: W 82 DEG 19 MIN 01 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

NORTHING: 3209416 EASTING: 371731

POINT OF REFERENCE: CRE BODY

PRECISION: 500 METERS

ELEVATION: 28 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING

FEE OWNERSHIP

OWNERSHIP

STATUS

SEVERAL SMALL OWNERSHIPS

OWNER

COMMODITY MODIFIER

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

FLUORINE

RECOVERABLE

URANIUM

RECOVERABLE

IRON

AFFECT MARKETABILITY

ALUMINUM

AFFECT MARKETABILITY

MAGNESIUM

AFFECT MARKETABILITY

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR NORTHERN, EAST COAST, AND HARD ROCK DISTRICTS IN FLORIDA IS 10.507 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.46% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB286 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

YEAR OF DISCOVERY: 1880

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; PEDDING

**LITHOLOGY:**

NAME OF FORMATION: ALACHUA FORMATION      GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SIO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: DEEP CREEK

SEQUENCE NUMBER: 0120230001

NATION: USA STATE: FLORIDA

COUNTY: COLUMBIA

TYPE OF OPERATION: SURFACE

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 30 DEG 20 MIN 02 SEC

LONGITUDE: W 82 DEG 38 MIN 28 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

NORTHING: 3356742 EASTING: 342237

POINT OF REFERENCE: ORE ECDY

PRECISION: 500 METERS

ELEVATION: 40 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
MINERALS ONLY; PRIVATE LEASEALTERNATE NAMES  
MONSANTO TRACTOWNERSHIP  
OCCIDENTAL CHEMICAL COMPANYSTATUS  
OWNER-OPERATOR

COMMODITY MODIFIER

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

FLUORINE

RECOVERABLE

URANIUM

RECOVERABLE

IRON

AFFECT MARKETABILITY

ALUMINUM

AFFECT MARKETABILITY

MAGNESIUM

AFFECT MARKETABILITY

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR COLUMBIA COUNTY, FLORIDA IS 1.478 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.5% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I.C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

YEAR OF DISCOVERY: 1960

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION: BONE VALLEY FORMATION      GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: NORTH LAKE CITY DEPOSIT      SEQUENCE NUMBER: 0120230002

NATION: USA      STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 30 DEG 18 MIN 00 SEC  
 UTM - ZONE: 17      HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 40 METERS  
 DATUM: SEA LEVEL

COUNTY: COLUMBIA  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 82 DEG 30 MIN 00 SEC  
 NORTHING: 3352800      EASTING: 355754  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 PRIVATE LEASE; FEE OWNERSHIP;  
 MINERALS ONLY

OWNERSHIP  
 KERR-MCGEE CORPORATION

STATUS  
 OWNER-OPERATOR

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR COLUMBIA COUNTY, FLORIDA IS 1.478 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.5% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I.C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE  
 YEAR OF DISCOVERY: 1962

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: BONE VALLEY FORMATION      GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
GUARTZ	FORMS OF SIO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: NORTH COLUMBIA COUNTY #2 SEQUENCE NUMBER: 0120230003

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 30 DEG 29 MIN 28 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 45 METERS  
 DATUM: SEA LEVEL

COUNTY: COLUMBIA  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 82 DEG 30 MIN 29 SEC  
 NORTHING: 3373991 EASTING: 355262  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

OWNERSHIP  
 SOUTHERN RESIN CORPORATION  
 UNKNOWN PRIVATE OWNERS

STATUS  
 OWNER  
 OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR COLUMBIA COUNTY, FLORIDA IS 1.478 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.5% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I.C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE  
 YEAR OF DISCOVERY: 1966

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION:	HAWTHORN FORMATION	GEOLOGIC AGE:	MIocene
ROCK TYPE:			
PHOSPHORITE	IS ORE		
SAND	GANGUE		
SILT	GANGUE		
CLAY	GANGUE		
DOLOMITE	GANGUE		

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SIO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: OSCEOLA NATIONAL FOREST      SEQUENCE NUMBER: 0120230004

NATION: USA	STATE: FLORIDA	COUNTY: COLUMBIA
TYPE OF OPERATION: SURFACE		CURRENT STATUS: EXPLORED DEPOSIT
LATITUDE: N 30 DEG 19 MIN 01 SEC		LONGITUDE: W 82 DEG 27 MIN 04 SEC
UTM - ZONE: 17	HEMISPHERE: NORTHERN	NORTHING: 3354616 EASTING: 360480
POINT OF REFERENCE: ORE BODY		PRECISION: 1 KILOMETER
ELEVATION: 35 METERS		PRECISION: 10 METERS
DATUM: SEA LEVEL		YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEDERAL LEASE; FEE OWNERSHIP

## OWNERSHIP

U.S. FOREST SERVICE, DEPARTMENT OF AGRICULTURE  
NUMEROUS SMALL PRIVATE OWNERSHIPS  
PITTSBURG AND MIDWAY COAL MINING COMPANY  
GLOBAL EXPLORATION AND DEVELOPMENT CORPORATION  
KERR-MCGEE CHEMICAL CORPORATION  
MONSANTO CHEMICAL PRODUCTS COMPANY

STATUS  
OWNER  
OWNER  
OPERATOR  
OPERATOR  
OPERATOR  
OPERATOR

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
LATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR COLUMBIA COUNTY, FLORIDA IS 1.478 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.5% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I.C. (IN PFESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
GEOLOGICAL INFERENCE  
YEAR OF DISCOVERY: 1965

-----EXPLORATION METHODS-----  
CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION:	BONE VALLEY FORMATION	GEOLOGIC AGE:	MIocene
ROCK TYPE:			
PHOSPHORITE	IS ORE		
SAND	GANGUE		
SILT	GANGUE		
CLAY	GANGUE		
DOLOMITE	GANGUE		

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: COLUMBIA COUNTY #1 DEPOSIT SEQUENCE NUMBER: 0120230005

NATION: USA	STATE: FLORIDA	COUNTY: COLUMBIA
TYPE OF OPERATION: PROSPECT		CURRENT STATUS: EXPLORED DEPOSIT
LATITUDE: N 30 DEG 04 MIN 29 SEC		LONGITUDE: W 82 DEG 30 MIN 00 SEC
UTM - ZONE: 17	HEMISPHERE: NORTHERN	NORTHING: 3331526 EASTING: 355474
POINT OF REFERENCE: ORE BODY		PRECISION: 100 METERS
ELEVATION: 40 METERS		PRECISION: 10 METERS
DATUM: SEA LEVEL		YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP: MINERALS ONLY

ALTERNATE NAMES  
LULU DEPOSIT

OWNERSHIP	STATUS	
GONZALES FAMILY	OWNER	
RAYONIER INCORPORATED	OWNER-OPERATOR	
OTHER UNIDENTIFIED OWNERS	OWNER	
COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR NORTHERN, EAST COAST, AND HARD ROCK DISTRICTS IN FLORIDA IS 10.507 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.46% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLAWS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB28A 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
GEOLOGICAL INFERENCE

----- EXPLORATION METHODS -----  
CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION:	HAWTHORN FORMATION	GEOLOGIC AGE:	MIocene
ROCK TYPE:			
PHOSPHORITE	IS ORE		
SAND	GANGUE		
SILT	GANGUE		
CLAY	GANGUE		
DOLOMITE	GANGUE		

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

U.S. GEOLOGICAL SURVEY. SUPPLEMENTAL LAND USE, VALDOSTA. U.S. GEOL. SURVEY OPEN FILE 76-013-7, 1972.

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: NORTH COLUMBIA DEPOSIT	SEQUENCE NUMBER: 0120230006
NATION: USA STATE: FLORIDA	COUNTY: COLUMBIA
TYPE OF OPERATION: PROSPECT	CURRENT STATUS: EXPLORED DEPOSIT
LATITUDE: N 30 DEG 29 MIN 49 SEC	LONGITUDE: W 82 DEG 36 MIN 40 SEC
UTM - ZONE: 17 HEMISPHERE: NORTHERN	NORTHING: 3374773 EASTING: 345379
POINT OF REFERENCE: ORE BODY	PRECISION: 500 METERS
ELEVATION: 40 METERS	PRECISION: 10 METERS
DATUM: SEA LEVEL	YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR NORTHERN, EAST COAST, AND HARD ROCK DISTRICTS IN FLORIDA IS 10.507 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.46% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB286 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1960

-----EXPLORATION METHODS-----  
CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: HAWTHORN FORMATION      GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SIO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: DESOTO-MANATEE RESERVE      SEQUENCE NUMBER: 0120270001

NATION: USA      STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 14 MIN 28 SEC  
 UTM - ZONE: 17      HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 17 METERS  
 DATUM: SEA LEVEL

COUNTY: DE SOTO  
 CURRENT STATUS: DEVELOPING DEPOSIT  
 LONGITUDE: W 82 DEG 03 MIN 00 SEC  
 NORTHING: 3013408      EASTING: 396042  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP

OWNERSHIP	STATUS	
AMAX	OWNER	
COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR DESOTO AND SARASOTA COUNTIES, FLORIDA IS 1.175 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.9% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I.C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE  
 YEAR OF DISCOVERY: 1964

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: BONE VALLEY FORMATION      GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ZELLARS-WILLIAMS, INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286-648/AS, 1978. 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: PINE LEVEL DEPOSIT

SEQUENCE NUMBER: 0120270002

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 15 MIN 00 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 18 METERS  
 DATUM: SEA LEVEL

COUNTY: DE SOTO  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 81 DEG 59 MIN 28 SEC  
 NORTHING: 3014345 EASTING: 401880  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
FEE OWNERSHIPOWNERSHIP  
AMAXSTATUS  
OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR DESOTO AND SARASOTA COUNTIES, FLORIDA IS 1.175 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.9% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I.C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

YEAR OF DISCOVERY: 1967

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: TABULAR; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: BONE VALLEY FORMATION

GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	APHANITIC
DOLOMITE	CARBONATES	APHANITIC

BIBLIOGRAPHY RECORDS

ZELLAR-WILLIAMS, INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEMS. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286-648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: HORSE CREEK, D.E. CARLTON      SEQUENCE NUMBER: 0120270003

NATION: USA      STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 19 MIN 01 SEC  
 UTM - ZONE: 17      HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 20 METERS  
 DATUM: SEA LEVEL

COUNTY: DE SOTO  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 81 DEG 56 MIN 10 SEC  
 NORTHING: 3021718      EASTING: 407381  
 PRECISION: 1 KILOMETER  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIPOWNERSHIP  
D.E. CARLTONSTATUS  
OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

## RESERVE/ RESOURCE - REMARKS

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR MANATEE, SARASOTA, AND DESOTO COUNTIES, FLORIDA IS 8.447 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.59% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCES: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PE 286 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
GEOLOGICAL INFERENCE  
YEAR OF DISCOVERY: 1968

-----EXPLORATION METHODS-----  
CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION:	HAWTHORN FORMATION	GEOLOGIC AGE:	MIocene
ROCK TYPE:			
PHOSPHORITE	IS ORE		
SAND	GANGUE		
SILT	GANGUE		
CLAY	GANGUE		
DOLOMITE	GANGUE		

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
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NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: W. BETHEL AND ADJACENT DEPOSITS SEQUENCE NUMBER: 0120270004

NATION: USA	STATE: FLORIDA	COUNTY: DE SOTO
TYPE OF OPERATION: PROSPECT		CURRENT STATUS: EXPLORED DEPOSIT
LATITUDE: N 27 DEG 19 MIN 16 SEC		LONGITUDE: W 82 DEG 06 MIN 00 SEC
UTM - ZONE: 17	HEMISPHERE: NORTHERN	NORTHING: 3022312 EASTING: 391170
POINT OF REFERENCE: ORE BODY		PRECISION: 100 METERS
ELEVATION: 25 METERS		PRECISION: 10 METERS
DATUM: SEA LEVEL		YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

OWNERSHIP	STATUS
W. BETHEL	OWNER
SMALL ADJACENT TRACTS	OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR MANATEE, SARASOTA, AND DESOTO COUNTIES, FLORIDA IS 8.447 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.59% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCES: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:	-----EXPLORATION METHODS-----
GEOLOGICAL INFERENCE	GEOLOGICAL INFERENCE

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY:	SEDIMENTARY; DISSEMINATED; REPLACEMENT
MODE OF ORIGIN:	SEDIMENTATION; RESIDUAL CONCENTRATION
SHAPE OF ORE BODY:	MASSIVE; IRREGULAR
CONTROLLING FEATURES:	LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: HAWTHORN FORMATION                    GEOLOGIC AGE: MIocene

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SUWANNEE RIVER MINE

SEQUENCE NUMBER: 0120470001

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 30 DEG 26 MIN 13 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 44 METERS  
 DATUM: SEA LEVEL

COUNTY: HAMILTON  
 CURRENT STATUS: PRODUCER  
 LONGITUDE: W 82 DEG 46 MIN 37 SEC  
 NORTHING: 3368362 EASTING: 329357  
 PRECISION: 500 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 PRIVATE LEASE; FEE OWNERSHIP

OWNERSHIP  
 OCCIDENTAL CHEMICAL COMPANY

STATUS  
 OWNER-OPERATOR

COMMON ELEMENT	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR NORTHERN, EAST COAST, AND HARD ROCK DISTRICTS IN FLORIDA IS 10.507 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.46% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PE286 548/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

YEAR OF DISCOVERY: 1960

YEAR OF INITIAL PRODUCTION: 1965

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: BONE VALLEY FORMATION      GEOLOGIC AGE: MIOCENE

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**MINE/MILL INFORMATION****SURFACE MINING:**

METHOD: STRIPPING

**DESCRIPTION OF COVER:**10 PERCENT SAND,SILT  
90 PERCENT QUICKSAND

PERCENT WASTE ROCK: 52.4

BENCH HEIGHT: 0 METERS

**HARDNESS OF ORE:**

QUICKSAND

SLOPE OF PIT: 65 DEGREES

**TRANSPORTATION (ORE):**

ORIGINATING FACILITY: MINE

LATITUDE: N 30 26 13

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: PIPELINE

DESTINATION FACILITY: MILL (ON-SITE)

LATITUDE: N 30 26 13

LOCATION: USA FLORIDA

LONGITUDE: W 82 46 37

DISTANCE (KM): 3.2

LOCATION: USA FLORIDA

LONGITUDE: W 82 46 37

**BENEFICIATION:**

METHOD: FLOTATION

**---DESCRIPTION OF MILLING---**

SLURRY/SCREEN/RINSE/ROD MILL/

GRIND/FLOTATION/DRY

**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY: MILL (ON-SITE)

LATITUDE: N 30 26 13

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: CONVEYOR

DESTINATION FACILITY: REFINERY

LATITUDE: N 30 26 13

LOCATION: USA FLORIDA

LONGITUDE: W 82 46 37

DISTANCE (KM): 1

LOCATION: ON-SITE CHEMICAL PLANT

LONGITUDE: W 82 46 37

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SWIFT CREEK MINE	SEQUENCE NUMBER: 0120470003
NATION: USA STATE: FLORIDA	COUNTY: HAMILTON
TYPE OF OPERATION: SURFACE	CURRENT STATUS: PRODUCER
LATITUDE: N 30 DEG 26 MIN 49 SEC	LONGITUDE: W 82 DEG 51 MIN 22 SEC
UTM - ZONE: 17 HEMISPHERE: NORTHERN	NORTHING: 3369593 EASTING: 321771
POINT OF REFERENCE: ORE BODY	PRECISION: 500 METERS
ELEVATION: 45 METERS	PRECISION: 10 METERS
DATUM: SEA LEVEL	YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
PRIVATE LEASE; FEE OWNERSHIP

OWNERSHIP	STATUS	
OCCIDENTAL CHEMICAL COMPANY	OWNER-OPERATOR	
COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR NORTHERN, EAST COAST, AND HARD ROCK DISTRICTS IN FLORIDA IS 10.507 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.46% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB286 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:	-----EXPLORATION METHODS-----
GEOLOGICAL INFERENCE	CORE DRILLING
YEAR OF DISCOVERY: 1960	
YEAR OF INITIAL PRODUCTION: 1975	

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
SHAPE OF ORE BODY: TABULAR; LENTICULAR  
CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: BONE VALLEY FORMATION

GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**MINE/MILL INFORMATION****SURFACE MINING:**

METHOD: STRIPPING

**DESCRIPTION OF COVER:**10 PERCENT SAND, SILT  
90 PERCENT QUICKSAND

BENCH HEIGHT: 0 METERS

**HARDNESS OF ORE:**

QUICKSAND

**SLOPE OF PIT:** 60 DEGREES**TRANSPORTATION (OPE):**

ORIGINATING FACILITY: MINE

LOCATION: USA FLORIDA

LATITUDE: N 30 26 49

LONGITUDE: W 82 51 22

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: PIPELINE

LOCATION: USA FLORIDA

DESTINATION FACILITY: MILL (ON-SITE)

LONGITUDE: W 82 51 22

LATITUDE: N 30 26 49

**BENEFICIATION:**

METHOD: FLOTATION

**-----DESCRIPTION OF MILLING-----**  
SLURRY/SCREEN/RINSE/ROD MILL/GRIND/  
FLOTATION/DRY**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: USA FLORIDA

LATITUDE: N 30 26 49

LONGITUDE: W 82 51 22

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: CONVEYOR

DISTANCE (KM): 0.5

DESTINATION FACILITY: REFINERY

LOCATION: USA FLORIDA

LATITUDE: N 30 26 13

LONGITUDE: W 82 46 37

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ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: HAMILTON COUNTY RECONNAISSANCE SEQUENCE NUMBER: 0120470004

NATION: USA	STATE: FLORIDA	COUNTY: HAMILTON
TYPE OF OPERATION: PROSPECT		CURRENT STATUS: EXPLORED DEPOSIT
LATITUDE: N 30 DEG 28 MIN 16 SEC		LONGITUDE: W 82 DEG 56 MIN 10 SEC
UTM - ZONE: 17	HEMISPHERE: NORTHERN	NORTHING: 3372401 EASTING: 314133
POINT OF REFERENCE: ORE BODY		PRECISION: 100 METERS
ELEVATION: 50 METERS		PRECISION: 10 METERS
DATUM: SEA LEVEL		YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

OWNERSHIP	STATUS
UNIDENTIFIED OWNERS	UNKNOWN

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR NORTHERN, EAST COAST, AND HARD ROCK DISTRICTS IN FLORIDA IS 10.507 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.46% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: F52E6 648/AS, 1978, 199 PP.

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: HAWTHORN FORMATION      GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: WHITE SPRINGS DEPOSIT      SEQUENCE NUMBER: 0120470005

NATION: USA      STATE: FLORIDA  
 TYPE OF OPERATION: PROSPECT  
 LATITUDE: N 30 DEG 20 MIN 28 SEC  
 UTM - ZONE: 17      HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 40 METERS  
 DATUM: SEA LEVEL

COUNTY: HAMILTON  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 82 DEG 42 MIN 47 SEC  
 NORTHING: 3357646      EASTING: 335332  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP

OWNERSHIP  
 BROWN WOOD PRESERVING COMPANY

STATUS  
 OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR NORTHERN, EAST COAST, AND HARD ROCK DISTRICTS IN FLORIDA IS 10.507 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.46% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB286 648/AS, 1978, 199 PP.

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: HAWTHORN FORMATION      GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SIO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: FARMLAND HARDEE MINE      SEQUENCE NUMBER: 0120490001

NATION: USA      STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 27 MIN 11 SEC  
 UTM - ZONE: 17      HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 25 METERS  
 DATUM: SEA LEVEL

COUNTY: HARDEE  
 CURRENT STATUS: DEVELOPING DEPOSIT  
 LONGITUDE: W 81 DEG 53 MIN 35 SEC  
 NORTHING: 3036764      EASTING: 411749  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
FEE OWNERSHIPALTERNATE NAMES  
DUVAL CORPORATION MINEOWNERSHIP  
FARMLAND INDUSTRIES INCORPORATEDSTATUS  
OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR HARDEE COUNTY, FLORIDA IS 4.710 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.8% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1955

-----EXPLORATION METHODS-----  
CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

LITHOLOGY:

NAME OF FORMATION: BONE VALLEY FORMATION                    GEOLOGIC AGE: MIocene

ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

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HERALD ADVOCATE. "FARMLAND INDUSTRIES EYES 1981-82 MINING". APRIL 21, 1977.

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: ACREFOOT JOHNSON

SEQUENCE NUMBER: 0120490002

NATION: USA STATE: FLORIDA

COUNTY: HARDEE

TYPE OF OPERATION: SURFACE

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 27 DEG 22 MIN 30 SEC

LONGITUDE: W 81 DEG 52 MIN 01 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

NORTHING: 3028100 EASTING: 414270

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 22 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING

FEE OWNERSHIP: PRIVATE LEASE:

MINERALS ONLY

ALTERNATE NAMES

LIMESTONE CREEK

OWNERSHIP

FREEPORT PHOSPHATE MINING COMPANY

STATUS

OWNER

COMMODITY

MODIFIER

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

FLUORINE

RECOVERABLE

URANIUM

RECOVERABLE

IRON

RECOVERABLE

ALUMINUM

AFFECT MARKETABILITY

MAGNESIUM

AFFECT MARKETABILITY

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR HARDEE COUNTY, FLORIDA IS 4.710 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.8% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION:	BONE VALLEY FORMATION	GEOLOGIC AGE:	MIocene
PHOSPHORITE	IS ORE		
SAND	GANGUE		
SILT	GANGUE		
CLAY	GANGUE		
DOLOMITE	GANGUE		

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

ZELLAR-WILLIAMS, INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEMS. BUMINES OPEN FILE REPORT  
112-78, NTIS: PB 286-648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: B. H. GRIFFIN SEQUENCE NUMBER: 0120490003

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 24 MIN 30 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 20 METERS  
 DATUM: SEA LEVEL

COUNTY: HARDEE  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 81 DEG 49 MIN 10 SEC  
 NORTHING: 3031760 EASTING: 418991  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIPALTERNATE NAMES  
ZOLFO AREAOWNERSHIP  
B. H. GRIFFINSTATUS  
OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR HARDEE COUNTY, FLORIDA IS 6.82E PILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.79% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATIONDISCOVERY METHOD:  
GEOLOGICAL INFERENCE-----EXPLORATION METHODS-----  
CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION: BONE VALLEY FORMATION      GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286-648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: C F HARDEE PHOSPHATE COMPLEX SEQUENCE NUMBER: 0120490004

NATION: USA	STATE: FLORIDA	COUNTY: HARDEE
TYPE OF OPERATION: SURFACE		CURRENT STATUS: PRODUCER
LATITUDE: N 27 DEG 35 MIN 02 SEC		LONGITUDE: W 81 DEG 55 MIN 52 SEC
UTM - ZONE: 17	HEMISPHERE: NORTHERN	NORTHING: 3051283 EASTING: 408097
POINT OF REFERENCE: ORE BODY		PRECISION: 500 METERS
ELEVATION: 31 METERS		PRECISION: 10 METERS
DATUM: SEA LEVEL		YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIPALTERNATE NAMES  
HARDEE MINEOWNERSHIP  
C F INDUSTRIES, INCORPORATED  
C F MINING CORPORATIONSTATUS  
OWNER  
OPERATOR

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR HARDEE COUNTY, FLORIDA IS 4.710 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.8% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
GEOLOGICAL INFERENCE  
YEAR OF DISCOVERY: 1975  
YEAR OF INITIAL PRODUCTION: 1978

-----EXPLORATION METHODS-----  
CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION: BONE VALLEY FORMATION      GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
COLLOPHANE	PHOSPHATES	VARIABLE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE
CALCITE	CARBONATES	VARIABLE

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: STRIPPING

## DESCRIPTION OF COVER:

10 PERCENT SAND, SILT

## HARDNESS OF ORE:

90 PERCENT QUICKSAND

QUICKSAND

PERCENT WASTE ROCK: 44.0 METERS

## SLOPE OF PIT: 60 DEGREES

BENCH HEIGHT: 0 METERS

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE

LOCATION: WAUCHULA, FLA.

LATITUDE: N 27 35 02

LONGITUDE: W 81 55 52

PERCENT SHIPPED: 100

DISTANCE (KM): 3.2

METHOD OF TRANSPORTATION: PIPELINE

LOCATION: WAUCHULA, FLA.

DESTINATION FACILITY: MILL (ON-SITE)

LONGITUDE: W 81 55 52

LATITUDE: N 27 35 02

## BENEFICIATION:

METHOD: FLOTATION

-----DESCRIPTION OF MILLING-----  
SLURRY/SCREEN/RINSE/PEBBLE PRODUCT/  
FEED TO FLOTATION/CLAY TO DISPOSAL

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK  
ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: WAUCHULA, FLA.  
LATITUDE: N 27 35 02 LONGITUDE: W 81 55 52  
PERCENT SHIPPED: 100  
METHOD OF TRANSPORTATION: RAIL DISTANCE (KM): 40  
DESTINATION FACILITY: CHEMICAL PLANT LOCATION: BARTOW, FLA.  
LATITUDE: N 27 50 00 LONGITUDE: W 81 50 00

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS, INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286-648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: HARDEE MINE

SEQUENCE NUMBER: 0120490005

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 29 MIN 31 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 26 METERS  
 DATUM: SEA LEVEL

COUNTY: HARDEE  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 81 DEG 56 MIN 45 SEC  
 NORTHING: 3041111 EASTING: 406566  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 PRIVATE LEASE; FEE OWNERSHIP

ALTERNATE NAMES  
 MISSISSIPPI CHEMICAL CORPORATION

OWNERSHIP  
 MISSISSIPPI CHEMICAL CORPORATION

STATUS  
 OWNER-OPERATOR

COMMODITY	MODIFIER
PHOSPHATE	
FLUORINE	
URANIUM	U3O8 CONTENT
IRON	FERRIC OXIDE
ALUMINUM	ALUMINA
MAGNESIUM	OXIDE
WATER CONTENT	FREE WATER

MARKETABILITY
PRIMARY PRODUCT
RECOVERABLE
RECOVERABLE
AFFECT MARKETABILITY
AFFECT MARKETABILITY
AFFECT MARKETABILITY

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR HARDEE COUNTY, FLORIDA IS 4.710 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.8% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE  
 YEAR OF DISCOVERY: 1967

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION: BONE VALLEY FORMATION      GEOLOGIC AGE: MIocene  
ROCK TYPE:  
PHOSPHORITE      IS ORE  
SAND      GANGUE  
SILT      GANGUE  
CLAY      GANGUE  
DOLOMITE      GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
GUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS, INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: HORSE CREEK

SEQUENCE NUMBER: 0120490006

NATION: USA STATE: FLORIDA

COUNTY: HARDEE

TYPE OF OPERATION: SURFACE

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 27 DEG 26 MIN 49 SEC

LONGITUDE: W 81 DEG 59 MIN 46 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

NORTHING: 3036164 EASTING: 401559

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 25 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING

FEE OWNERSHIP

OWNERSHIP

INTERNATIONAL MINERALS CORPORATION

STATUS

OWNER

COMMODITY

MODIFIER

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

FLUORINE

RECOVERABLE

URANIUM

RECOVERABLE

IRON

AFFECT MARKETABILITY

ALUMINUM

AFFECT MARKETABILITY

MAGNESIUM

AFFECT MARKETABILITY

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR HARDEE COUNTY, FLORIDA IS 6.826 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.79% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

YEAR OF DISCOVERY: 1965

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION:	BONE VALLEY FORMATION	GEOLOGIC AGE:	MIocene
ROCK TYPE:			
PHOSPHORITE	IS ORE		
SAND	GANGUE		
SILT	GANGUE		
CLAY	GANGUE		
DOLOMITE	GANGUE		

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
 USING THE MINERALS AVAILABILITY SYSTEM. HUMINES OPEN FILE REPORT 112-78  
 NTIS: PR 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: DURRANCE/WATERS TRACT

SEQUENCE NUMBER: 0120490007

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 34 MIN 30 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 37 METERS  
 DATUM: SEA LEVEL

COUNTY: HARDEE  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 82 DEG 01 MIN 30 SEC  
 NORTHING: 3050373 EASTING: 398821  
 PRECISION: 1 KILOMETER  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP: MINERALS ONLY

OWNERSHIP  
 U.S.S. AGRI-CHEMICALS

STATUS  
 OWNER

COMMODITY	MODIFIER
PHOSPHATE	
FLUORINE	
URANIUM	U308 CONTENT
IRON	FERRIC OXIDE
ALUMINUM	ALUMINA
MAGNESIUM	OXIDE
WATER CONTENT	FREE WATER

MARKETABILITY
PRIMARY PRODUCT
RECOVERABLE
RECOVERABLE
AFFECT MARKETABILITY
AFFECT MARKETABILITY
AFFECT MARKETABILITY

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR HARDEE COUNTY, FLORIDA IS 4.710 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.8% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

YEAR OF DISCOVERY: 1961

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: HAWTHORN FORMATION      GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
GUARTZ	FORMS OF SIO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: HARDEE WEST PROSPECT

SEQUENCE NUMBER: 0120490008

NATION: USA STATE: FLORIDA

COUNTY: HARDEE

TYPE OF OPERATION: SURFACE

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 27 DEG 22 MIN 13 SEC

LONGITUDE: W 81 DEG 59 MIN 24 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

NORTHING: 3027667 EASTING: 402096

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 31 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

OWNERSHIP

20-25 PRIVATE PROPERTIES

STATUS

OWNER

COMMODITY

MODIFIER

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

FLUORINE

RECOVERABLE

URANIUM

RECOVERABLE

IRON

AFFECT MARKETABILITY

ALUMINUM

AFFECT MARKETABILITY

MAGNESIUM

AFFECT MARKETABILITY

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR HARDEE COUNTY, FLORIDA IS 4.710 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.8% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

YEAR OF DISCOVERY: 1975

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: HONE VALLEY FORMATION

GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
COLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
COLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PF 286-64F/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: LIMESTONE LAND COMPANY	SEQUENCE NUMBER: 0120490009
NATION: USA STATE: FLORIDA	COUNTY: HARDEE
TYPE OF OPERATION: SURFACE	CURRENT STATUS: EXPLORED DEPOSIT
LATITUDE: N 27 DEG 25 MIN 30 SEC	LONGITUDE: W 81 DEG 56 MIN 00 SEC
UTM - ZONE: 17 HEMISPHERE: NORTHERN	NORTHING: 3033686 EASTING: 407746
POINT OF REFERENCE: ORE BODY	PRECISION: 100 METERS
ELEVATION: 26 METERS	PRECISION: 10 METERS
DATUM: SEA LEVEL	YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

ALTERNATE NAMES  
FARMLAND, MISSISSIPPI CHEM. AREA

OWNERSHIP	STATUS	
MR. D.E. CARLTON AND MR. M. WEBER	OWNER	
COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR HARDEE COUNTY, FLORIDA IS 6.826 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.79% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
GEOLOGICAL INFERENCE  
YEAR OF DISCOVERY: 1955

-----EXPLORATION METHODS-----  
CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION: HAWTHORN FORMATION

GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHOCRITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
GUAR TZ	FCRMS OF SiO <sub>2</sub>	VARIABLE
COLLOF HANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: MANSON-JENKINS

SEQUENCE NUMBER: 0120490010

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 32 MIN 13 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 38 METERS  
 DATUM: SEA LEVEL

COUNTY: HARDEE  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 82 DEG 02 MIN 49 SEC  
 NORTHING: 3046175 EASTING: 396620  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP: PRIVATE LEASE

ALTERNATE NAMES  
 USS AGRI-CHEMICALS

OWNERSHIP  
 USS AGRI-CHEMICALS  
 FIRST NATIONAL BANK OF TAMPA

STATUS  
 OWNER  
 OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABLITY
ALUMINUM	ALUMINA	AFFECT MARKETABLITY
MAGNESIUM	OXIDE	AFFECT MARKETABLITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR HARDEE COUNTY, FLORIDA IS 4.710 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.8% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

GEOLOGICAL INFERENCE

YEAR OF DISCOVERY: 1965

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION: HAWTHORN FORMATION      GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
 USING THE MINERALS AVAILABILITY SYSTEM. FUMINES OPEN FILE REPORT 112-78,  
 NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: WATERS TRACT

SEQUENCE NUMBER: 0120490011

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 37 MIN 26 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 43 METERS  
 DATUM: SEA LEVEL

COUNTY: HARDEE  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 82 DEG 01 MIN 59 SEC  
 NORTHING: 3055794 EASTING: 398072  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP

OWNERSHIP  
 USS AGRI-CHEMICALS

STATUS  
 OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR HARDEE COUNTY, FLORIDA IS 4.710 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.8% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE  
 YEAR OF DISCOVERY: 1964

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION: BONE VALLEY FORMATION      GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: ZOLFO SPRINGS AREA SMALL OWNERSHIPS SEQUENCE NUMBER: 0120490012

NATION: USA	STATE: FLORIDA	COUNTY: HARDEE
TYPE OF OPERATION: SURFACE		CURRENT STATUS: EXPLORED DEPOSIT
LATITUDE: N 27 DEG 27 MIN 00 SEC		LONGITUDE: W 81 DEG 46 MIN 40 SEC
UTM - ZONE: 17	HEMISPHERE: NORTHERN	NORTHING: 3036349 EASTING: 423140
POINT OF REFERENCE: CRE BODY		PRECISION: 100 METERS
ELEVATION: 22 METERS		PRECISION: 10 METERS
DATUM: SEA LEVEL		YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIPOWNERSHIP  
MINING DEVELOPMENT CORPORATION  
VARIOUS PRIVATE OWNERSSTATUS  
OWNER  
OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR HARDEE COUNTY, FLORIDA IS 4.710 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.8% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATIONDISCOVERY METHOD:  
GEOLOGICAL INFERENCE-----EXPLORATION METHODS-----  
CORE DRILLINGGEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: HAWTHORN FORMATION      GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOFILMITE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLomite	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. PUMILLES OPEN FILE REPORT 112-78,  
ATIS: PF 285 648/AS, 1978, 199 PF.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: OLLIFF OPTION	SEQUENCE NUMBER: 0120490013	
NATION: USA STATE: FLORIDA	COUNTY: HARDEE	
TYPE OF OPERATION: SURFACE	CURRENT STATUS: EXPLORED DEPOSIT	
LATITUDE: N 27 DEG 32 MIN 40 SEC	LONGITUDE: W 81 DEG 57 MIN 20 SEC	
UTM - ZONE: 17 HEMISPHERE: NORTHERN	NORTHING: 3046933 EASTING: 405651	
POINT OF REFERENCE: ORE BODY	PRECISION: 100 METERS	
ELEVATION: 33 METERS	PRECISION: 10 METERS	
DATUM: SEA LEVEL	YEAR OF INFORMATION: 1979	
OWNERSHIP		
MATRID OLLIFF	STATUS OWNER	
COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR HARDEE COUNTY, FLORIDA IS 6.826 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.79% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:	-----EXPLORATION METHODS-----
GEOLOGICAL INFERENCE	CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: BONE VALLEY FORMATION

GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPOST 112-78,  
NTIS: PE 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: FREEPORT AREA SMALL OWNERSHIPS SEQUENCE NUMBER: 0120490014

NATION: USA	STATE: FLORIDA	COUNTY: HARDEE
TYPE OF OPERATION: SURFACE		CURRENT STATUS: EXPLORED DEPOSIT
LATITUDE: N 27 DEG 24 MIN 30 SEC		LONGITUDE: W 81 DEG 53 MIN 30 SEC
UTM - ZONE: 17	HEMISPHERE: NORTHERN	NORTHING: 3031809 EASTING: 411851
POINT OF REFERENCE: ORE BODY		PRECISION: 100 METERS
ELEVATION: 16 METERS		PRECISION: 10 METERS
DATUM: SEA LEVEL		YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIPALTERNATE NAMES  
LEFFIE CARLTON - OVERLOOK GROVE

OWNERSHIP	STATUS
FREEPORT PHOSPHATE MINING COMPANY	OWNER
OVERLOOK GROVES, INCORPORATED	OWNER
VARIOUS PRIVATE OWNERS	OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR HARDEE COUNTY, FLORIDA IS 6.825 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.79% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATIONDISCOVERY METHOD:  
GEOLOGICAL INFERENCE-----EXPLORATION METHODS-----  
CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION: HAWTHORN FORMATION      GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHOCRITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLORPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: D. E. CARLTON

SEQUENCE NUMBER: 0120490015

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 31 MIN 20 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 38 METERS  
 DATUM: SEA LEVEL

COUNTY: HARDEE  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 81 DEG 50 MIN 40 SEC  
 NORTHING: 3044392 EASTING: 416605  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP

OWNERSHIP  
 D.E.CARLTON

STATUS  
 OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR HARDEE COUNTY, FLORIDA IS 6.826 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.79% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

GEOLOGICAL INFERENCE

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: HAWTHORN FORMATION

GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: FARMLAND/ONA AREA-SMALL OWNERSHIP      SEQUENCE NUMBER: 0120490016

NATION: USA	STATE: FLORIDA	COUNTY: HARDEE
TYPE OF OPERATION: SURFACE		CURRENT STATUS: EXPLORED DEPOSIT
LATITUDE: N 27 DEG 26 MIN 38 SEC		LONGITUDE: W 81 DEG 52 MIN 37 SEC
UTM - ZONE: 17	HEMISPHERE: NORTHERN	NORTHING: 3035737 EASTING: 413334
POINT OF REFERENCE: ORE BODY		PRECISION: 100 METERS
ELEVATION: 17 METERS		PRECISION: 10 METERS
DATUM: SEA LEVEL		YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

OWNERSHIP	STATUS	
MISCELLANEOUS FEE-OWNED LANDS	OWNER	
COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR HARDEE COUNTY, FLORIDA IS 6.826 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.79% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
GEOLOGICAL INFERENCE  
YEAR OF DISCOVERY: 1965

-----EXPLORATION METHODS-----  
CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: BONE VALLEY FORMATION

GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLORHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CAFFONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ZELLARS-WILLIAMS, INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUREAU OF MINES OPEN FILE REPORT  
112-78, NTIS: PB 286-648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: ZOLFO / STAUFFER  
 NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 28 MIN 30 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 15 METERS  
 DATUM: SEA LEVEL

SEQUENCE NUMBER: 0120490017  
 COUNTY: HARDEE  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 81 DEG 46 MIN 54 SEC  
 NORTHING: 3039121 EASTING: 422773  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP

OWNERSHIP  
 STAUFFER CHEMICAL COMPANY

STATUS  
 OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR HARDEE COUNTY, FLORIDA IS 4.710 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.8% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: PONCE VALLEY FORMATION      GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SIO <sub>2</sub>	VARIABLE
MICROPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

STAUFFER CHEMICAL COMPANY. 1976 ANNUAL REPORT.

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 649/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: MOBIL AREA

SEQUENCE NUMBER: 0120490018

NATION: USA STATE: FLORIDA

COUNTY: HARDEE

TYPE OF OPERATION: SURFACE

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 27 DEG 36 MIN 12 SEC

LONGITUDE: W 81 DEG 44 MIN 30 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

NORTHING: 3053312 EASTING: 426810

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 35 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING

FEE OWNERSHIP

OWNERSHIP

NUMEROUS SMALL OWNERSHIPS

STATUS

OWNER

COMMODITY

MODIFIER

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

FLUORINE

RECOVERABLE

URANIUM

U308 CONTENT

RECOVERABLE

IRON

FERRIC OXIDE

AFFECT MARKETABILITY

ALUMINUM

ALUMINA

AFFECT MARKETABILITY

MAGNESIUM

OXIDE

AFFECT MARKETABILITY

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR HARDEE COUNTY, FLORIDA IS 4.710 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.8% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

GEOLOGICAL INFERENCE

-----EXPLORATION METHODS-----

CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: HAWTHORN FORMATION

GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SOUTH HARDEE

SEQUENCE NUMBER: 0120490019

NATION: USA STATE: FLORIDA

COUNTY: HARDEE

TYPE OF OPERATION: SURFACE

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 27 DEG 31 MIN 40 SEC

LONGITUDE: W 81 DEG 58 MIN 30 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

NORTHING: 3045101 EASTING: 403716

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 28 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING

FEE OWNERSHIP; MINERALS ONLY

## ALTERNATE NAMES

GARDINIER SOUTH HARDEE DEPOSIT

## OWNERSHIP

GARDINIER INC.

## STATUS

OWNER ,

STAUFFER CHEMICAL COMPANY

UNKNOWN

## COMMODITY

## MODIFIER

## MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

FLUORINE

RECOVERABLE

URANIUM

U308 CONTENT

RECOVERABLE

IRON

FERRIC OXIDE

AFFECT MARKETABILITY

ALUMINUM

ALUMINA

AFFECT MARKETABILITY

MAGNESIUM

OXIDE

AFFECT MARKETABILITY

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR HARDEE COUNTY, FLORIDA IS 4.710 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.8% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

## -----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

YEAR OF DISCOVERY: 1974

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION:	HAWTHORN FORMATION	GEOLOGIC AGE:	MIocene
ROCK TYPE:			
PHOSPHORITE	IS ORE		
SAND	GANGUE		
SILT	GANGUE		
CLAY	GANGUE		
DOLOMITE	GANGUE		

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SHARP PROPERTY

SEQUENCE NUMBER: 0120490020

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 20 MIN 46 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 27 METERS  
 DATUM: SEA LEVEL

COUNTY: HARDEE  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 82 DEG 01 MIN 30 SEC  
 NORTHING: 3025018 EASTING: 398612  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP

ALTERNATE NAMES  
 SOUTHWEST HARDEE NORTHWEST DESOTO

OWNERSHIP  
 H. SHARP

STATUS  
 OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABLITY
ALUMINUM	ALUMINA	AFFECT MARKETABLITY
MAGNESIUM	OXIDE	AFFECT MARKETABLITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR HARDEE COUNTY, FLORIDA IS 6.826 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.79% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION:	HAWTHORN FORMATION	GEOLOGIC AGE:	MIocene
ROCK TYPE:			
CLAY	GANGUE		
SAND	GANGUE		
SILT	GANGUE		
PHOSPHORITE	IS ORE		
DOLOMITE	GANGUE		

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SIO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLomite	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT  
112-78, NTIS: P5 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: BOYETTE II

SEQUENCE NUMBER: 0120570001

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 48 MIN 11 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 27 METERS  
 DATUM: SEA LEVEL

COUNTY: HILLSBOROUGH  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 82 DEG 13 MIN 23 SEC  
 NORTHING: 3075814 EASTING: 379521  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP

## ALTERNATE NAMES

JACK O. HOLMES NURSERIES  
 BOYETTE  
 FISH HAWK  
 LITHIA

OWNERSHIP  
 AGRICO CHEMICAL COMPANY

## STATUS

OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABLITY
ALUMINUM	ALUMINA	AFFECT MARKETABLITY
MAGNESIUM	OXIDE	AFFECT MARKETABLITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR HILLSBOROUGH COUNTY, FLORIDA IS 900 MILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 7.5% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

GEOLOGICAL INFERENCE

-----EXPLORATION METHODS-----

CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION: BONE VALLEY FORMATION                    GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

WILLIAMS COMPANIES. 1976 FORM 10-K REPORT.

ZELLARS-WILLIAMS, INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78;  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: BIG FOUR

SEQUENCE NUMBER: 0120570002

NATION: USA STATE: FLORIDA

COUNTY: HILLSBOROUGH

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 27 DEG 44 MIN 38 SEC

LONGITUDE: W 82 DEG 04 MIN 41 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

NORTHING: 3069125 EASTING: 393748

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 33 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING

FEE OWNERSHIP

OWNERSHIP

AMAX

STATUS

OWNER-OPERATOR

COMMODITY

MODIFIER

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

FLUORINE

RECOVERABLE

URANIUM

RECOVERABLE

IRON

U308 CONTENT

AFFECT MARKETABILITY

ALUMINUM

FERRIC OXIDE

AFFECT MARKETABILITY

MAGNESIUM

ALUMINA

AFFECT MARKETABILITY

WATER CONTENT

OXIDE

AFFECT MARKETABILITY

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR HILLSBOROUGH COUNTY, FLORIDA IS 900 MILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 7.5% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

YEAR OF DISCOVERY: 1910

YEAR OF INITIAL PRODUCTION: 1977

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: BONE VALLEY FORMATION      GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**MINE/MILL INFORMATION****SURFACE MINING:**

METHOD: STRIPPING

**DESCRIPTION OF COVER:**

10 PERCENT SAND, SILT

90 PERCENT QUICKSAND

BENCH HEIGHT: 0 METERS

**HARDNESS OF ORE:**

QUICKSAND

**SLOPE OF PIT:** 65 DEGREES**TRANSPORTATION (ORE):**

ORIGINATING FACILITY: MINE

LOCATION: USA FLORIDA

LATITUDE: N 27 44 38

LONGITUDE: W 82 04 41

METHOD OF TRANSPORTATION: PIPELINE

DISTANCE (KM): 3.2

DESTINATION FACILITY: MILL (ON-SITE)

LOCATION: USA FLORIDA

LATITUDE: N 27 44 38

LONGITUDE: W 82 04 41

**BENEFICIATION:**

METHOD: FLOTATION

----- DESCRIPTION OF MILLING -----  
 SLURRY/SCREEN/RINSE/PEBBLE PRODUCT/  
 FEED TO FLOTATION/CLAY TO DISPOSAL

**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: USA FLORIDA

LATITUDE: N 27 44 38

LONGITUDE: W 82 04 41

METHOD OF TRANSPORTATION: RAIL

DISTANCE (KM): 118

DESTINATION FACILITY: REFINERY

LOCATION: PINEY PT., FL

LATITUDE: N 27 40 00

LONGITUDE: W 82 30 00

**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: USA FLORIDA

LATITUDE: N 27 44 38

LONGITUDE: W 82 04 41

METHOD OF TRANSPORTATION: RAIL

DISTANCE (KM): 45

DESTINATION FACILITY: REFINERY

LOCATION: PLANT CITY, FL

LATITUDE: N 28 00 00

LONGITUDE: W 82 10 00

BIBLIOGRAPHY RECORDS

BORDEN INCORPORATED. 1976 ANNUAL REPORT.

ZELLARS-WILLIAMS, INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: LONESOME MINE

SEQUENCE NUMBER: 0120570003

NATION: USA STATE: FLORIDA

COUNTY: HILLSBOROUGH

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 27 DEG 44 MIN 28 SEC

LONGITUDE: W 82 DEG 07 MIN 23 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

NORTHING: 3068858 EASTING: 389309

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 35 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP: PRIVATE LEASEOWNERSHIP  
BREWSTER PHOSPHATESSTATUS  
OWNER-OPERATOR

COMMODITY MODIFIER

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

FLUORINE

RECOVERABLE

URANIUM

RECOVERABLE

IRON

AFFECT MARKETABILITY

ALUMINUM

AFFECT MARKETABILITY

MAGNESIUM

AFFECT MARKETABILITY

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

RECORD 1

UNDIFFERENTIATED 50,803,200  
UNITS MT ORE  
YEAR/DATA 1981

IN SITU GRADE:

RECORD ASSAY FORM GRADE UNIT  
1 P205 23.5 % BONE PHOSPHATE OF LIME

## RESERVE-RESOURCE - REMARKS

SOURCE FOR RECORD 1:

ENGINEERING AND MINING JOURNAL. INTERNATIONAL DIRECTORY OF MINING,  
1981. P. 190.DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

YEAR OF INITIAL PRODUCTION: 1976

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION:	BONE VALLEY FORMATION	GEOLOGIC AGE:	MIocene
ROCK TYPE:			
PHOSPHORITE	IS ORE		
SAND	GANGUE		
SILT	GANGUE		
CLAY	GANGUE		
DOLOMITE	GANGUE		

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: STRIPPING

## DESCRIPTION OF COVER:

10 PERCENT SAND, SILT

90 PERCENT QUICKSAND

## HARDNESS OF ORE:

QUICKSAND

## SLOPE OF PIT: 60 DEGREES

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE

LOCATION: USA FLORIDA

LATITUDE: N 27 44 28

LONGITUDE: W 82 07 23

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: PIPELINE

LOCATION: USA FLORIDA

DESTINATION FACILITY: MILL (ON-SITE)

LONGITUDE: W 82 07 23

LATITUDE: N 27 44 28

## BENEFICIATION:

METHOD: FLOTATION

-----DESCRIPTION OF MILLING-----  
 SLURRY/SCREEN/RINSE/PEBBLE PRODUCT  
 FEED FLOTATION/CLAY DISPOSAL

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE)

LOCATION: USA FLORIDA

LATITUDE: N 27 44 28

LONGITUDE: W 82 07 23

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: RAIL

DESTINATION FACILITY: UNDETERMINED

BIBLIOGRAPHY RECORDS

ENGINEERING AND MINING JOURNAL. INTERNATIONAL DIRECTORY OF MINING, 1981,  
P. 190.

HOPPE, RICHARD W. PHOSPHATE ARE VITAL TO AGRICULTURE - AND FLORIDA MINES  
FOR OVER ONE-THIRD THE WORLD. END. AND MIN. J., MAY 1976, PP. 79-89.

ZELLAR-WILLIAMS, INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: FLORIDA AGGLITE DEBRIS PLANT SEQUENCE NUMBER: 0120570004

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 54 MIN 54 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 40 METERS  
 DATUM: SEA LEVEL

COUNTY: HILLSBOROUGH  
 CURRENT STATUS: PAST PRODUCER  
 LONGITUDE: W 82 DEG 07 MIN 16 SEC  
 NORTHING: 3088120 EASTING: 389677  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 MINERALS ONLY

ALTERNATE NAMES  
 AHCAN  
 GOOCH  
 MCKAY  
 RAINBOW  
 DEAN STREET

OWNERSHIP  
 SOUTHERN INDUSTRIES

STATUS  
 OPERATOR

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR HILLSBOROUGH COUNTY, FLORIDA IS 1.060 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 7.19% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

DEPOSIT\_HISTORICAL\_INFORMATION

DISCOVERY METHOD:

GEOLOGICAL INFERENCE

YEAR OF DISCOVERY: 1935

YEAR OF FINAL PRODUCTION: 1977

-----EXPLORATION METHODS-----  
CORE DRILLINGGEOLOGIC\_AND\_SPATIAL\_CHARACTERISTICS\_OF\_DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION:	BONE VALLEY FORMATION	GEOLOGIC AGE: MIOCENE
ROCK TYPE:		
PHOSPHORITE	IS GRE	
SAND	GANGUE	
SILT	GANGUE	
CLAY	GANGUE	
DOLOMITE	GANGUE	

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY\_RECORDS

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
 USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
 NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: FIRST MISSISSIPPI CHEMICAL TRACT      SEQUENCE NUMBER: 0120570005

NATION: USA	STATE: FLORIDA	COUNTY: HILLSBOROUGH
TYPE OF OPERATION: SURFACE		CURRENT STATUS: EXPLORED DEPOSIT
LATITUDE: N 27 DEG 41 MIN 38 SEC		LONGITUDE: W 82 DEG 11 MIN 20 SEC
UTM - ZONE: 17	HEMISPHERE: NORTHERN	NORTHING: 3063687 EASTING: 382770
POINT OF REFERENCE: ORE BODY		PRECISION: 500 METERS
ELEVATION: 21 METERS		PRECISION: 10 METERS
DATUM: SEA LEVEL		YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIPOWNERSHIP  
FIRST MISSISSIPPI CORPORATIONSTATUS  
OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABLITY
ALUMINUM	ALUMINA	AFFECT MARKETABLITY
MAGNESIUM	OXIDE	AFFECT MARKETABLITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR HILLSBOROUGH COUNTY, FLORIDA IS 900 MILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 7.5% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATIONDISCOVERY METHOD:  
GEOLOGICAL INFERENCE-----EXPLORATION METHODS-----  
CORE DRILLINGGEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: BONE VALLEY FORMATION      GEOLOGIC AGE: MIocene  
ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SIO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: FARMLAND HILLSBOROUGH RESERVE      SEQUENCE NUMBER: 0120570006

NATION: USA    STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 44 MIN 20 SEC  
 UTM - ZONE: 17    HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 21 METERS  
 DATUM: SEA LEVEL

COUNTY: HILLSBOROUGH  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 82 DEG 12 MIN 00 SEC  
 NORTHING: 3068683    EASTING: 381722  
 PRECISION: 500 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP

OWNERSHIP  
 FARMLAND INDUSTRIES INCORPORATED

STATUS  
 OWNER-OPERATOR

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR HILLSBOROUGH COUNTY, FLORIDA IS 900 MILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 7.5% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE  
 YEAR OF DISCOVERY: 1930

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: BONE VALLEY FORMATION

GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLICHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: HILLSBOROUGH CO.-FARMLAND/BREWSTER      SEQUENCE NUMBER: 0120570007

NATION: USA      STATE: FLORIDA      COUNTY: HILLSBOROUGH  
 TYPE OF OPERATION: SURFACE      CURRENT STATUS: EXPROLED DEPOSIT  
 LATITUDE: N 27 DEG 48 MIN 00 SEC      LONGITUDE: W 82 DEG 09 MIN 30 SEC  
 UTM - ZONE: 17      HEMISPHERE: NORTHERN      NORTHING: 3075414      EASTING: 385893  
 POINT OF REFERENCE: ORE BODY      PRECISION: 100 METERS  
 ELEVATION: 30 METERS      PRECISION: 10 METERS  
 DATUM: SEA LEVEL      YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

OWNERSHIP	STATUS	
VARIOUS PRIVATE OWNERS	OWNER	
COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABLITY
ALUMINUM	ALUMINA	AFFECT MARKETABLITY
MAGNESIUM	OXIDE	AFFECT MARKETABLITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR HILLSBOROUGH COUNTY, FLORIDA IS 900 MILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 7.5% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:	EXPLORATION METHODS-----
GEOLOGICAL INFERENCE	CORE DRILLING
YEAR OF DISCOVERY: 1950	

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: BONE VALLEY FORMATION      GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SIO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: HUNT BROTHERS RANCH

SEQUENCE NUMBER: 0120570008

NATION: USA STATE: FLORIDA

COUNTY: HILLSBOROUGH

TYPE OF OPERATION: SURFACE

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 27 DEG 40 MIN 30 SEC

LONGITUDE: W 82 DEG 07 MIN 56 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

NORTHING: 3061543 EASTING: 388338

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 35 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

OWNERSHIP

STATUS

INTERNATIONAL MINERALS  
AND CHEMICAL CORP.

OWNER

COMMODITY

MODIFIER

MARKETABILITY

PRIMARY PRODUCT

PHOSPHATE

RECOVERABLE

FLUORINE

RECOVERABLE

URANIUM

U308 CONTENT

AFFECT MARKETABILITY

IRON

FERRIC OXIDE

AFFECT MARKETABILITY

ALUMINUM

ALUMINA

AFFECT MARKETABILITY

MAGNESIUM

OXIDE

AFFECT MARKETABILITY

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR HILLSBOROUGH COUNTY, FLORIDA IS 900 MILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 7.5% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: BONE VALLEY FORMATION

GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SIO <sub>2</sub>	VARIABLE
COLLIGNANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: STANALAND RANCH

SEQUENCE NUMBER: 0120570009

NATION: USA STATE: FLORIDA

COUNTY: HILLSBOROUGH

TYPE OF OPERATION: SURFACE

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 27 DEG 39 MIN 50 SEC

LONGITUDE: W 82 DEG 11 MIN 00 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

NORTHING: 3060358 EASTING: 383286

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 27 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING

FEE OWNERSHIP

ALTERNATE NAMES

ARCO-STANALAND RANCH

OWNERSHIP

INTERNATIONAL MINERALS AND  
CHEMICAL CORP.

STATUS

OWNER

COMMODITY

MODIFIER

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

FLUORINE

RECOVERABLE

URANIUM

U3O8 CONTENT

RECOVERABLE

IRON

FERRIC OXIDE

AFFECT MARKETABILITY

ALUMINUM

ALUMINA

AFFECT MARKETABILITY

MAGNESIUM

OXIDE

AFFECT MARKETABILITY

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR HILLSBOROUGH COUNTY, FLORIDA IS 900 MILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 7.5% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

GEOLOGICAL INFERENCE

-----EXPLORATION METHODS-----  
CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION: BONE VALLEY FORMATION      GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
 USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
 NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: HOPEWELL MINE

SEQUENCE NUMBER: 0120570010

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 55 MIN 30 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 37 METERS  
 DATUM: SEA LEVEL

COUNTY: HILLSBOROUGH  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 82 DEG 06 MIN 20 SEC  
 NORTHING: 3089214 EASTING: 391218  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP

OWNERSHIP  
 AMERICAN CYANAMID COMPANY

STATUS  
 OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR HILLSBOROUGH COUNTY, FLORIDA IS 900 MILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 7.5% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: BONE VALLEY FORMATION

GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SIO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: FB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: LITHIA-BOYETTE

SEQUENCE NUMBER: 0120570011

NATION: USA STATE: FLORIDA

COUNTY: HILLSBOROUGH

TYPE OF OPERATION: SURFACE

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 27 DEG 50 MIN 30 SEC

LONGITUDE: W 82 DEG 07 MIN 30 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

NORTHING: 3079999 EASTING: 389219

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 26 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING

FEE OWNERSHIP

OWNERSHIP

AMERICAN CYANAMID COMPANY

STATUS

OWNER

COMMODITY MODIFIER

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

FLUORINE

RECOVERABLE

URANIUM

RECOVERABLE

IRON

AFFECT MARKETABILITY

ALUMINUM

AFFECT MARKETABILITY

MAGNESIUM

AFFECT MARKETABILITY

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR HILLSBOROUGH COUNTY, FLORIDA IS 1.060 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 7.19% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: BONE VALLEY FORMATION      GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SIO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: EAST PIERCE DEPOSIT

SEQUENCE NUMBER: 0120570012

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 59 MIN 30 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 47 METERS  
 DATUM: SEA LEVEL

COUNTY: HILLSBOROUGH  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 82 DEG 10 MIN 00 SEC  
 NORTHING: 3096655 EASTING: 385275  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP

OWNERSHIP	STATUS	
NATIONWIDE PROPERTIES (A SUBSIDIARY OF ESMARK, INC)	OWNER	
COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABLITY
ALUMINUM	ALUMINA	AFFECT MARKETABLITY
MAGNESIUM	OXIDE	AFFECT MARKETABLITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR HILLSBOROUGH COUNTY, FLORIDA IS 1.060 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 7.19% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

YEAR OF DISCOVERY: 1920

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: BONE VALLEY FORMATION

GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SIO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 285 E48/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: COOKS HAMMOCK #1

SEQUENCE NUMBER: 0120670001

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 29 DEG 56 MIN 38 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 20 METERS  
 DATUM: SEA LEVEL

COUNTY: LAFAYETTE  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 83 DEG 18 MIN 00 SEC  
 NORTHING: 3314611 EASTING: 278011  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP

OWNERSHIP  
 MONSANTO CHEMICAL PRODUCTS CORP.  
 OTHER UNIDENTIFIED OWNERS

STATUS  
 OWNER  
 OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABLITY
ALUMINUM	ALUMINA	AFFECT MARKETABLITY
MAGNESIUM	OXIDE	AFFECT MARKETABLITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR NORTHERN, EAST COAST, AND HARD ROCK DISTRICTS IN FLORIDA IS 10.507 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.46% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78. NTIS: PB286 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE  
 YEAR OF DISCOVERY: 1965

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: ALACHUA FORMATION

GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286-648/AS 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: COOKS HAMMOCK #2

SEQUENCE NUMBER: 0120670002

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 29 DEG 53 MIN 13 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 18 METERS  
 DATUM: SEA LEVEL

COUNTY: LAFAYETTE  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 83 DEG 13 MIN 26 SEC  
 NORTHING: 3308155 EASTING: 285237  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP

OWNERSHIP  
 UNIDENTIFIED MAJOR PAPER COMPANY

STATUS  
 OWNER-OPERATOR

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABLILITY
ALUMINUM	ALUMINA	AFFECT MARKETABLILITY
MAGNESIUM	OXIDE	AFFECT MARKETABLILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR NORTHERN, EAST COAST, AND HARD ROCK DISTRICTS IN FLORIDA IS 10.507 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.46% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB286 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: ALACHUA FORMATION

GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SIO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: LAKE COUNTY DEPOSIT

SEQUENCE NUMBER: 0120690001

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: PROSPECT  
 LATITUDE: N 28 DEG 50 MIN 35 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 7 METERS  
 DATUM: SEA LEVEL

COUNTY: LAKE  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 81 DEG 29 MIN 38 SEC  
 NORTHING: 3190521 EASTING: 451822  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP

OWNERSHIP  
 SEMINOLE WOODS, INC.

STATUS  
 OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABLITY
ALUMINUM	ALUMINA	AFFECT MARKETABLITY
MAGNESIUM	OXIDE	AFFECT MARKETABLITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR NORTHERN, EAST COAST, AND HARD ROCK DISTRICTS IN FLORIDA IS 10.507 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.46% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB286 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE  
 YEAR OF DISCOVERY: 1960

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: HAWTHORN FORMATION      GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SIO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: WINGATE CREEK

SEQUENCE NUMBER: 0120810001

NATION: USA STATE: FLORIDA

COUNTY: MANATEE

TYPE OF OPERATION: SURFACE

CURRENT STATUS: DEVELOPING DEPOSIT

LATITUDE: N 27 DEG 29 MIN 28 SEC

LONGITUDE: W 82 DEG 09 MIN 11 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

NORTHING: 3041191 EASTING: 386094

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 35 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING

FEE OWNERSHIP: MINERALS ONLY

ALTERNATE NAMES

BEKER PHOSPHATE MINE

OWNERSHIP

BEKER PHOSPHATE CORPORATION  
UNION OIL CORPORATION

STATUS

OWNER-OPERATOR  
OWNER

COMMODITY

MODIFIER

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

FLUORINE

RECOVERABLE

URANIUM

U308 CONTENT

RECOVERABLE

IRON

FERRIC OXIDE

AFFECT MARKETABILITY

ALUMINUM

ALUMINA

AFFECT MARKETABILITY

MAGNESIUM

OXIDE

AFFECT MARKETABILITY

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR MANATEE COUNTY, FLORIDA IS 6.383 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.7% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

YEAR OF DISCOVERY: 1964

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION:	BONE VALLEY FORMATION	GEOLOGIC AGE:	MIocene
ROCK TYPE:			
PHOSPHORITE	IS ORE		
SAND	GANGUE		
SILT	GANGUE		
CLAY	GANGUE		
DOLOMITE	GANGUE		

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

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ZELLARS-WILLIAMS, INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: FOUR CORNERS

SEQUENCE NUMBER: 0120810002

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 39 MIN 50 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 44 METERS  
 DATUM: SEA LEVEL

COUNTY: MANATEE  
 CURRENT STATUS: DEVELOPING DEPOSIT  
 LONGITUDE: W 82 DEG 05 MIN 28 SEC  
 NORTHING: 3060275 EASTING: 392382  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP: MINERALS ONLY

ALTERNATE NAMES  
 P AND R SHELL PIT

OWNERSHIP  
 W. R. GRACE AND COMPANY

STATUS  
 OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABLITY
ALUMINUM	ALUMINA	AFFECT MARKETABLITY
MAGNESIUM	OXIDE	AFFECT MARKETABLITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR MANATEE COUNTY, FLORIDA IS 6.383 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.7% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----  
 GEOLOGICAL INFERENCE  
 YEAR OF DISCOVERY: 1920 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

CONTROLLING FEATURE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION: BONE VALLEY FORMATION      GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOFILM	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLomite	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

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ZELLARS-WILLIAMS, INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUREAU OF MINES OPEN FILE REPORT 112-78, NTIS: PE 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: DUETTE MINE

SEQUENCE NUMBER: 0120810003

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 33 MIN 11 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 39 METERS  
 DATUM: SEA LEVEL

COUNTY: MANATEE  
 CURRENT STATUS: DEVELOPING DEPOSIT  
 LONGITUDE: W 82 DEG 07 MIN 23 SEC  
 NORTHING: 3048026 EASTING: 389120  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP

ALTERNATE NAMES  
 MANATEE MINE

OWNERSHIP  
 ESTECH GENERAL CHEMICALS CORP.

STATUS  
 OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR MANATEE COUNTY, FLORIDA IS 6.383 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.7% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE  
 YEAR OF DISCOVERY: 1900

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION: BONE VALLEY FORMATION

GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

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USING THE MINERALS AVAILABILITY SYSTEM. BUREAU OF MINES OPEN FILE REPORT  
112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: KEYS PROPERTY

SEQUENCE NUMBER: 0120810004

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 17 MIN 30 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 23 METERS  
 DATUM: SEA LEVEL

COUNTY: MANATEE  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 82 DEG 05 MIN 00 SEC  
 NORTHING: 3019036 EASTING: 392790  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING

FEE OWNERSHIP

OWNERSHIP	INTERNATIONAL MINERALS AND CHEMICAL CORPORATION	STATUS
		OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR MANATEE COUNTY, FLORIDA IS 6.383 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.7% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

YEAR OF DISCOVERY: 1965

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: HAWTHORN FORMATION      GEOLOGIC AGE: MIocene  
ROCK TYPE:  
PHOSPHORITE      IS CRE  
SAND      GANGUE  
SILT      GANGUE  
CLAY      GANGUE  
DOLOMITE      GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: DAVID C. TURNER HEIRS	SEQUENCE NUMBER: 0120810005
NATION: USA STATE: FLORIDA	COUNTY: MANATEE
TYPE OF OPERATION: SURFACE	CURRENT STATUS: EXPLORED DEPOSIT
LATITUDE: N 27 DEG 34 MIN 30 SEC	LONGITUDE: W 82 DEG 07 MIN 20 SEC
UTM - ZONE: 17 HEMISPHERE: NORTHERN	NORTHING: 3050456 EASTING: 389224
POINT OF REFERENCE: ORE BODY	PRECISION: 100 METERS
ELEVATION: 40 METERS	PRECISION: 10 METERS
DATUM: SEA LEVEL	YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

OWNERSHIP	STATUS
HEIRS OF DAVID C. TURNER	OWNER
CARLTON TURNER	OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR MANATEE COUNTY, FLORIDA IS 6.383 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.7% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:	-----EXPLORATION METHODS-----
GEOLOGICAL INFERENCE	CORE DRILLING
YEAR OF DISCOVERY: 1965	

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: HAWTHORN FORMATION      GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHCRITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SIO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: RUTLAND-COLVIN-VALE      SEQUENCE NUMBER: 0120810006

NATION: USA	STATE: FLORIDA	COUNTY: MANATEE
TYPE OF OPERATION: SURFACE		CURRENT STATUS: EXPLORED DEPOSIT
LATITUDE: N 27 DEG 34 MIN 00 SEC		LONGITUDE: W 82 DEG 16 MIN 40 SEC
UTM - ZONE: 17	HEMISPHERE: NORTHERN	NORTHING: 3049681 EASTING: 373859
POINT OF REFERENCE: ORE BODY		PRECISION: 100 METERS
ELEVATION: 33 METERS		PRECISION: 10 METERS
DATUM: SEA LEVEL		YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP: PRIVATE LEASE

OWNERSHIP	STATUS	
INTERNATIONAL MINERALS AND CHEMICAL CORPORATION	OPERATOR	
COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR MANATEE COUNTY, FLORIDA IS 6.383 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.7% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
GEOLOGICAL INFERENCE  
YEAR OF DISCOVERY: 1965

-----EXPLORATION METHODS-----  
CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION:	HAWTHORN FORMATION	GEOLIC AGE:	MIOCENE
ROCK TYPE:			
PHOSPHORITE	IS ORE		
SAND	GANGUE		
SILT	GANGUE		
CLAY	GANGUE		
DOLOMITE	GANGUE		

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
GUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS, INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUREAU OF MINES OPEN FILE REPORT 112-78. NTIS: PB 28E 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: NORTHEAST MANATEE-ALTMAN TRACT      SEQUENCE NUMBER: 0120810007

NATION: USA	STATE: FLORIDA	COUNTY: MANATEE
TYPE OF OPERATION: PROSPECT		CURRENT STATUS: EXPLORED DEPOSIT
LATITUDE: N 27 DEG 36 MIN 40 SEC		LONGITUDE: W 82 DEG 04 MIN 18 SEC
UTM - ZONE: 17	HEMISPHERE: NORTHERN	NORTHING: 3054412 EASTING: 394250
POINT OF REFERENCE: ORE BODY		PRECISION: 100 METERS
ELEVATION: 43 METERS		PRECISION: 10 METERS
DATUM: SEA LEVEL		YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

OWNERSHIP	STATUS	
L. P. ALTMAN	OWNER	
COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	AFFECT MARKETABILITY

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR MANATEE, SARASOTA, AND DESOTO COUNTIES, FLORIDA IS 8.447 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.59% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCES: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSITS

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: HAWTHORN FORMATION GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHURITE	IS CRE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOFPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PP 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: MANATEE NORTH	SEQUENCE NUMBER: 0120810008
NATION: USA STATE: FLORIDA	COUNTY: MANATEE
TYPE OF OPERATION: SURFACE	CURRENT STATUS: EXPLORED DEPOSIT
LATITUDE: N 27 DEG 31 MIN 10 SEC	LONGITUDE: W 82 DEG 12 MIN 30 SEC
UTM - ZONE: 17 HEMISPHERE: NORTHERN	NORTHING: 3044382 EASTING: 380663
POINT OF REFERENCE: ORE BODY	PRECISION: 100 METERS
ELEVATION: 33 METERS	PRECISION: 10 METERS
DATUM: SEA LEVEL	YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

OWNERSHIP	STATUS	
W. R. GRACE AND COMPANY	OWNER	
COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	AFFECT MARKETABILITY

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR MANATEE COUNTY, FLORIDA IS 6.383 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.7% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:	-----EXPLORATION METHODS-----
GEOLOGICAL INFERENCE	CORE DRILLING
YEAR OF DISCOVERY: 1957	

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: HAWTHORN FORMATION

GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS CRE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PH 286 648/AS, 1978. 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: TEXACO MANATEE      SEQUENCE NUMBER: 0120810009

NATION: USA      STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 29 MIN 53 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 37 METERS  
 DATUM: SEA LEVEL

COUNTY: MANATEE  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 82 DEG 04 MIN 59 SEC  
 NORTHING: 3041898 EASTING: 393016  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

OWNERSHIP	STATUS
TEXACO INCORPORATED	OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOV ERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR MANATEE COUNTY, FLORIDA IS 6.383 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.7% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:	-----EXPLORATION METHODS-----
GEOLOGICAL INFERENCE	CORE DRILLING
YEAR OF DISCOVERY: 1965	

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: HAWTHORN/BONE VALLEY FORMATIONS

GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: MANATEE SOUTH

SEQUENCE NUMBER: 0120810010

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 24 MIN 30 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 23 METERS  
 DATUM: SEA LEVEL

COUNTY: MANATEE  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 82 DEG 11 MIN 30 SEC  
 NORTHING: 3032057 EASTING: 382192  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP

OWNERSHIP  
 W. R. GRACE AND COMPANY

STATUS  
 OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR MANATEE COUNTY, FLORIDA IS 6.383 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.7% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT\_HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: HAWTHORN FORMATION

GEOLOGIC AGE: MIOCENE

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. U.S. BUREAU OF MINES OPEN FILE  
REPORT 112-78, NTIS: PB 28E 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: TURNER PROPERTY	SEQUENCE NUMBER: 0120810011
NATION: USA STATE: FLORIDA	COUNTY: MANATEE
TYPE OF OPERATION: SURFACE	CURRENT STATUS: EXPLORED DEPOSIT
LATITUDE: N 27 DEG 34 MIN 16 SEC	LONGITUDE: W 82 DEG 08 MIN 38 SEC
UTM - ZONE: 17 HEMISPHERE: NORTHERN	NORTHING: 3050045 EASTING: 387082
POINT OF REFERENCE: ORE BODY	PRECISION: 100 METERS
ELEVATION: 35 METERS	PRECISION: 10 METERS
DATUM: SEA LEVEL	YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

OWNERSHIP	STATUS	
DAVID JR. AND NEIL TURNER	OWNER	
COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR MANATEE, SARASOTA, AND DESOTO COUNTIES, FLORIDA IS 8.447 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.59% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCES: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:	-----EXPLORATION METHODS-----
GEOLOGICAL INFERENCE	CORE DRILLING
YEAR OF DISCOVERY: 1955	

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATE; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: HAWTHORN FORMATION                    GEOLOGIC AGE: MIOCENE

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: NORTHEAST MANATEE SWIFT/GRAVE SEQUENCE NUMBER: 0120810012

NATION: USA	STATE: FLORIDA	COUNTY: MANATEE
TYPE OF OPERATION: SURFACE		CURRENT STATUS: EXPLORED DEPOSIT
LATITUDE: N 27 DEG 34 MIN 50 SEC		LONGITUDE: W 82 DEG 10 MIN 00 SEC
UTM - ZONE: 17	HEMISPHERE: NORTHERN	NORTHING: 3051112 EASTING: 384843
POINT OF REFERENCE: ORE BODY		PRECISION: 100 METERS
ELEVATION: 38 METERS		PRECISION: 10 METERS
DATUM: SEA LEVEL		YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP: PRIVATE LEASE

ALTERNATE NAMES  
NORTHEAST MANATEE  
W. SCHMID TRACT  
POLK TRACT  
LEROY CARLTON  
CARLTON PROPERTY ESTATE

OWNERSHIP	STATUS	
NUMEROUS PRIVATE OWNERS	OWNER	
W.R. GRACE AND COMPANY	OWNER	
COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR MANATEE COUNTY, FLORIDA IS 6.383 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.7% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
GEOLOGICAL INFERENCE  
YEAR OF DISCOVERY: 1966

-----EXPLORATION METHODS-----  
CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION: HAWTHORN FORMATION      GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
COLLOPHANE	PHOSPHATES	APHANITIC
DOLOMITE	CARBONATES	APHANITIC
QUARTZ	FORMS OF SiO <sub>2</sub>	APHANITIC

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PR 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SWIFT/DURRANCE AREA      SEQUENCE NUMBER: 0120810013

NATION: USA      STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 34 MIN 10 SEC  
 UTM - ZONE: 17      HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 40 METERS  
 DATUM: SEA LEVEL

COUNTY: MANATEE  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 82 DEG 05 MIN 00 SEC  
 NORTHING: 3049806 EASTING: 393058  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP

ALTERNATE NAMES  
 WALKER PROPERTY  
 BRADDOCK PROPERTY

OWNERSHIP  
 JUANITA & ISAAC ALBRITTON  
 J. D. WALKER  
 G. V. BRADDOCK  
 C. W. CONE & C. G. GREEN  
 20 SMALL OWNERSHIPS

STATUS  
 OWNER  
 OWNER  
 OWNER  
 OWNER  
 OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR MANATEE COUNTY, FLORIDA IS 6.383 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.7% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE  
 YEAR OF DISCOVERY: 1965

-----EXPLORATION METHODS-----  
 CORE DRILLING

## GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION: BONE VALLEY FORMATION      GEOLOGIC AGE: MIOCENE  
ROCK TYPE:

PROSEFOR

SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

## BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. U.S. BUREAU OF MINES OPEN FILE  
REPORT 112-78, NTIS: PB 286 648/AS 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: NORTHEAST MANATEE/TEXACO      SEQUENCE NUMBER: 0120810014

NATION: USA      STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 28 MIN 30 SEC  
 UTM - ZONE: 17      HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 25 METERS  
 DATUM: SEA LEVEL

COUNTY: MANATEE  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 82 DEG 07 MIN 00 SEC  
 NORTHING: 3039374      EASTING: 389673  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

OWNERSHIP  
 HENRY P. HOFFSTOT JR.  
 GEORGIA & HERMAN TAYLOR  
 BOWERS & JORDAN  
 D. A. TROIANO  
 FIVE SMALL OWNERSHIPS

STATUS  
 OWNER  
 UNKNOWN  
 OWNER  
 OWNER  
 OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR MANATEE COUNTY, FLORIDA IS 6.383 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.7% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE  
 YEAR OF DISCOVERY: 1965

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION: PINE VALLEY FORMATION      GEOLOGIC AGE: MIocene  
 ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
 USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
 NTIS: PE 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: HARD ROCK DEPOSIT

SEQUENCE NUMBER: 0120830015

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 28 DEG 54 MIN 29 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 15 METERS  
 DATUM: SEA LEVEL

COUNTY: MARION  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 82 DEG 23 MIN 28 SEC  
 NORTHING: 3198418 EASTING: 364376  
 PRECISION: 1 KILOMETER  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP; PRIVATE LEASE

OWNERSHIP  
 TRANSAMMONIA MINERALS CORPORATION

STATUS  
 OWNER-OPERATOR

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR NORTHERN, EAST COAST, AND HARD ROCK DISTRICTS IN FLORIDA IS 10.507 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.46% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB286 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

YEAR OF DISCOVERY: 1974

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION: ALACHUA FORMATION      GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

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DAVENPORT, J.E., F. CARROLL, G.W. KIEFFER AND S.C. WATKINS. BENEFICIATION OF FLORIDA HARD-ROCK PHOSPHATE. I&EC PROCESS DESIGN AND DEVELOPMENT, VOL 8, OCT 1969, PP. 527-533.

DAVENPORT, J.E. AND S.C. WATKINS. BENEFICIATION OF FLORIDA PEBBLE PHOSPHATE SLIME. I&EC PROCESS AND DESIGN DEVELOPMENT, VOL 8, OCT 1969, PP. 533-539.

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ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: PAYNE CREEK-PALMETTO

SEQUENCE NUMBER: 0121050001

NATION: USA STATE: FLORIDA

COUNTY: POLK

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 27 DEG 41 MIN 20 SEC

LONGITUDE: W 81 DEG 56 MIN 10 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

NORTHING: 3062918 EASTING: 407692

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 40 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

OWNERSHIP

AGRICO CHEMICAL COMPANY

STATUS

OWNER-OPERATOR

COMMODITY MODIFIER

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

FLUORINE

RECOVERABLE

URANIUM

RECOVERABLE

IRON

AFFECT MARKETABILITY

ALUMINUM

AFFECT MARKETABILITY

MAGNESIUM

AFFECT MARKETABILITY

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR POLK COUNTY, FLORIDA IS 2.519 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 8.0% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. P. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

YEAR OF INITIAL PRODUCTION: 1966

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: BONE VALLEY FORMATION      GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATIONS:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORM OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**MINE/MILL INFORMATION****SURFACE MINING:**

METHOD: STRIPPING

## DESCRIPTION OF COVER:

10 PERCENT SAND, SILT  
50 PERCENT QUICKSAND

## HARDNESS OF ORE:

QUICKSAND

SLOP OF PIT: 60 DEGREES

**TRANSPORTATION (ORE):**

CRUCINATING FACILITY: MINE

LATITUDE: N 27 41 20

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: PIPELINE

DESTINATION FACILITY: MILL (ON-SITE)

LATITUDE: N 27 41 20

LOCATION: USA FLORIDA

LONGITUDE: W 81 56 10

DISTANCE (KM): 3.22

LOCATION: USA FLORIDA

LONGITUDE: W 81 56 10

**BENEFICIATION:**

METHOD: FLOTATION

**-----DESCRIPTION OF MILLING-----**ORE SLURRY/SCREEN/PEBBLE WET ROCK/  
STORAGE/FEED FLOTATION/CONCENTRATE WET  
ROCK/STORAGE/WASTE RECLAMATION OR DISPOSAL**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

CRUCINATING FACILITY: MILL (ON-SITE)

LOCATION: USA FLORIDA

LATITUDE: N 27 41 20

LONGITUDE: W 81 56 10

PERCENT SHIPPED: 20

DISTANCE (KM): 60

METHOD OF TRANSPORTATION: RAIL

LOCATION: DONALDSONVILLE, LOUISIANA

DESTINATION FACILITY: REFINERY

LONGITUDE: W 91 00 00

LATITUDE: N 31 05 00

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK  
ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: USA FLORIDA  
LATITUDE: N 27 41 20 LONGITUDE: W 81 56  
10 FERCENT SHIPPED: 25  
METHOD OF TRANSPORTATION: RAIL DISTANCE (KM): 19  
DESTINATION FACILITY: REFINERY LOCATION: PIERCE, FLORIDA  
LATITUDE: N 27 55 00 LONGITUDE: W 82 00  
00

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK  
ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: USA FLORIDA  
LATITUDE: N 27 41 20 LONGITUDE: W 81 56  
10 PERCENT SHIPPED: 30  
DESTINATION FACILITY: FOB MILL LOCATION: EXPORT

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK  
ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: USA FLORIDA  
LATITUDE: N 27 41 20 LONGITUDE: W 81 56 10  
PERCENT SHIPPED: 25  
DESTINATION FACILITY: FOB MILL LOCATION: DOMESTIC

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NITS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: FORT GREEN MINE

SEQUENCE NUMBER: 0121050002

NATION: USA STATE: FLORIDA

COUNTY: POLK

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 27 DEG 40 MIN 05 SEC

LONGITUDE: W 82 DEG 00 MIN 25 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

NORTHING: 3060666 EASTING: 400688

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 45 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

## OWNERSHIP

AGRICO CHEMICAL COMPANY  
STAUFFER CHEMICAL COMPANY

## STATUS

OWNER-OPERATOR  
OWNER

## COMMODITY

## MODIFIER

## MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

FLUORINE

RECOVERABLE

URANIUM

RECOVERABLE

IRON

AFFECT MARKETABILITY

ALUMINUM

AFFECT MARKETABILITY

MAGNESIUM

AFFECT MARKETABILITY

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR POLK COUNTY, FLORIDA IS 2.519 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 8.0% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, P. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

GEOLOGICAL INFERENCE

## -----EXPLORATION METHODS-----

YEAR OF DISCOVERY: 1920

CORE DRILLING

YEAR OF INITIAL PRODUCTION: 1975

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION:	BONE VALLEY FORMATION	GEOLOGIC AGE:	MIOCENE
ROCK TYPE:			
PHOSPHORITE	IS ORE		
SAND	GANGUE		
SILT	GANGUE		
CLAY	GANGUE		
DOLOMITE	GANGUE		

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORM OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: STRIPPING  
 DESCRIPTION OF COVER:  
 10 PERCENT SAND, SILT  
 90 PERCENT QUICKSAND

HARDNESS OF ORE:  
 QUICKSAND

SLOPE OF PIT: 60 DEGREES

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE  
 LATITUDE: N 27 40 05  
 PERCENT SHIPPED: 100  
 METHOD OF TRANSPORTATION: PIPELINE  
 DESTINATION FACILITY: MILL (ON-SITE)  
 LATITUDE: N 27 40 05

LOCATION: USA FLORIDA  
 LONGITUDE: W 82 00 25  
 DISTANCE (KM): 3.22  
 LOCATION: USA FLORIDA  
 LONGITUDE: W 82 00 25

## BENEFICIATION:

METHOD: FLOTATION

-----DESCRIPTION OF MILLING-----  
 ORE SLURRY/SCREEN/PEBBLE WET ROCK STORAGE/  
 FEED FLOTATION/CONCENTRATE WET ROCK STORAGE/  
 WASTE RECLAMATION/DISPOSAL

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE)  
 LATITUDE: N 27 40 05  
 PERCENT SHIPPED: 30  
 DESTINATION FACILITY: FOB MILL

LOCATION: USA FLORIDA  
 LONGITUDE: W 82 00 25  
 LOCATION: EXPORT

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK  
ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: USA FLORIDA

LATITUDE: N 27 40 05 LONGITUDE: W 82 00 25

PERCENT SHIPPED: 20

METHOD OF TRANSPORTATION: RAIL DISTANCE (KM): 60

DESTINATION FACILITY: REFINERY LOCATION: DONALDSONVILLE, LA

LATITUDE: N 31 05 00 LONGITUDE: W 91 00 00

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: USA FLORIDA

LATITUDE: N 27 40 05 LONGITUDE: W 82 00 25

PERCENT SHIPPED: 25

METHOD OF TRANSPORTATION: RAIL DISTANCE (KM): 19

DESTINATION FACILITY: REFINERY LOCATION: PIERCE, FLORIDA

LATITUDE: N 27 55 00 LONGITUDE: W 82 00 00

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: USA FLORIDA

LATITUDE: N 27 40 05 LONGITUDE: W 82 00 25

PERCENT SHIPPED: 25

DESTINATION FACILITY: FOR MILL LOCATION: DOMESTIC

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ZELLARS-WILLIAMS, INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NITS: PD 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SADDLE CREEK-EBERSBACH

SEQUENCE NUMBER: 0121050003

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 28 DEG 01 MIN 59 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 38 METERS  
 DATUM: SEA LEVEL

COUNTY: POLK  
 CURRENT STATUS: PRODUCER  
 LONGITUDE: W 81 DEG 50 MIN 02 SEC  
 NORTHING: 3100972 EASTING: 418032  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP

ALTERNATE NAMES  
 SADDLE CREEK MINE

OWNERSHIP	STATUS	
AGRICO CHEMICAL COMPANY	OWNER-OPERATOR	
COMMODITY	MODIFIER	MARKE TABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR POLK COUNTY, FLORIDA IS 2.519 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 8.0% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

GEOLOGICAL INFERENCE

YEAR OF INITIAL PRODUCTION: 1968

-----EXPLORATION METHODS-----

CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION:	BONE VALLEY FORMATION	GEOLOGIC AGE:	MIocene
ROCK TYPE:			
PHOSPHORITE	IS ORE		
SAND	GANGUE		
SILT	GANGUE		
CLAY	GANGUE		
DOLOMITE	GANGUE		

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORM OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: STRIPPING

## DESCRIPTION OF COVER:

10 PERCENT SAND, SILT

90 PERCENT QUICKSAND

PERCENT WASTE ROCK: 62.9

## HARDNESS OF ORE:

QUICKSAND

## SLOPE OF PIT: 60 DEGREES

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE

LOCATION: USA FLORIDA

LATITUDE: N 28 01 59

LONGITUDE: W 81 50 02

PERCENT SHIPPED: 100

DISTANCE (KM): 13

METHOD OF TRANSPORTATION: PIPELINE

LOCATION: USA FLORIDA

DESTINATION FACILITY: MILL (ON-SITE)

LONGITUDE: W 81 50 02

LATITUDE: N 28 01 59

## BENEFICIATION:

METHOD: FLOTATION

## -----DESCRIPTION OF MILLING-----

ORE SLURRY/SCREEN

PEBBLE WET ROCK STORAGE/FEED FLOTATION/  
CONCENTRATE WET ROCK STORAGE/WASTE  
RECLAMATION OR DISPOSAL

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE)

LOCATION: USA FLORIDA

LATITUDE: N 28 01 59

LONGITUDE: W 81 50 02

PERCENT SHIPPED: 100

DISTANCE (KM): 60

METHOD OF TRANSPORTATION: RAIL

LOCATION: EXPORT

DESTINATION FACILITY: FOB PORT

BIBLIOGRAPHY RECORDS

THE WILLIAMS COMPANIES. 1976 FORM 10-K REPORT.

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: FIERCE-FEBBLEDALE

SEQUENCE NUMBER: 0121050004

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 49 MIN 55 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 45 METERS  
 DATUM: SEA LEVEL

COUNTY: POLK  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 81 DEG 57 MIN 36 SEC  
 NORTHING: 3078784 EASTING: 405460  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FREE OWNERSHIP

OWNERSHIP  
 AGRICO CHEMICAL COMPANY

STATUS  
 OWNER-OPERATOR

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

\*0 PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR POLK COUNTY, FLORIDA IS 2.519 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 8.0% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, F. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC: A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

GEOLOGICAL INFERENCE

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: BONE VALLEY FORMATION

GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORM OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

KENNECOTT COPPER CORPORATION. 1976 ANNUAL REPORT.

WILLIAMS COMPANIES. 1977 FORM 10-K REPORT.

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. U.S. BUREAU OF MINES OPEN FILE  
REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: HAYNSWORTH MINE

SEQUENCE NUMBER: 0121050005

NATION: USA STATE: FLORIDA

COUNTY: POLK

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 27 DEG 45 MIN 29 SEC

LONGITUDE: W 82 DEG 00 MIN 50 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

NORTHING: 3070641 EASTING: 400086

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 45 METERS

PRECISION: 10 METERS

DATUM: SFA LEVEL

YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING

FEE OWNERSHIP

OWNERSHIP

BREWSTER PHOSPHATES

STATUS

OPERATOR

AMERICAN CYANAMID

OWNFR

KERR-MCGEE CORPORATION

OWNFR

COMMODITY

MODIFIER

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

FLUORINE

RECOVERABLE

URANIUM

RECOVERABLE

IRON

AFFECT MARKETABLITY

ALUMINUM

AFFECT MARKETABLITY

MAGNESIUM

AFFECT MARKETABLITY

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

INDICATED

RECORD 1

UNITS

36,000,000

YEAR/DATA

MT CRE

1981

RESERVE-RESOURCE - REMARKS

SOURCE FOR RECORD 1:

ENGINEERING AND MINING JOURNAL. INTERNATIONAL DIRECTORY OF MINING.  
1981, P. 190.DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

YEAR OF INITIAL PRODUCTION: 1965

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: BONE VALLEY FORMATION

GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORM OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**MINE/MILL INFORMATION****SURFACE MINING:**

METHOD: STRIPPING

**DESCRIPTION OF COVER:**10 PERCENT SAND, SILT  
90 PERCENT QUICKSAND**HARDNESS OF ORE:**

QUICKSAND

**SLOPE OF PIT: 60 DEGREES****TRANSPORTATION (ORE):**

ORIGINATING FACILITY: MINE

LOCATION: USA FLORIDA

LATITUDE: N 27 45 29

LONGITUDE: W 82 00 50

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: PIPELINE

DISTANCE (KM): 3.2

DESTINATION FACILITY: MILL (ON-SITE)

LOCATION: USA FLORIDA

LATITUDE: N 27 45 29

LONGITUDE: W 82 00 50

**BENEFICIATION:**

METHOD: FLOTATION

**----- DESCRIPTION OF MILLING -----**  
SLURRY/WASH-RINSE/PEBBLE PRODUCT/FLOAT/  
CONCENTRATE PRODUCT/SHIP**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY: MILL (ON-SITE)

LOCATION: USA FLORIDA

LATITUDE: N 27 45 29

LONGITUDE: W 82 00 50

PERCENT SHIPPED: 70

METHOD OF TRANSPORTATION: RAIL

DISTANCE (KM): 80

DESTINATION FACILITY: REFINERY

LOCATION: UNCLE SAM, LOUISIANA

**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY: MILL (ON-SITE)

LOCATION: USA FLORIDA

LATITUDE: N 27 45 29

LONGITUDE: W 82 00 50

PERCENT SHIPPED: 30

METHOD OF TRANSPORTATION: RAIL

DISTANCE (KM): 80

DESTINATION FACILITY: FOB PORT

LOCATION: EXPORT

BIBLIOGRAPHY RECORDS

FERR-MCGEE CORPORATION. 1976 ANNUAL REPORT.

ZELLAR-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMTIES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 FP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: BONNY LAKE MINE

SEQUENCE NUMBER: 0121050006

NATION: USA STATE: FLORIDA

COUNTY: POLK

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 27 DEG 54 MIN 22 SEC

LONGITUDE: W 81 DEG 55 MIN 12 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

NORTHING: 3086970 EASTING: 409461

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 60 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

OWNERSHIP

W.R. GRACE AND COMPANY

STATUS

OWNER-OPERATOR

COMMODITY MODIFIER

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

FLUORINE

RECOVERABLE

URANIUM

RECOVERABLE

IRON

AFFECT MARKETABILITY

ALUMINUM

AFFECT MARKETABILITY

MAGNESIUM

AFFECT MARKETABILITY

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR POLK COUNTY, FLORIDA IS 2.519 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 8.0% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

YEAR OF INITIAL PRODUCTION: 1958

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION:	BONE VALLEY FORMATION	GEOLOGIC AGE:	MIocene
ROCK TYPE:			
PHOSPHORITE	IS ORE		
SAND	GANGUE		
SILT	GANGUE		
CLAY	GANGUE		
DOLOMITE	LIES OVER ORE; GANGUE		

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORM OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**MINE/MILL INFORMATION****SURFACE MINING:**

METHOD: STRIPPING  
 DESCRIPTION OF COVER:  
 10 PERCENT SAND, SILT  
 90 PERCENT QUICKSAND

HARDNESS OF ORE:  
 QUICKSAND

SLOPE OF PIT: 65 DEGREES

**TRANSPORTATION (ORE):**

ORIGINATING FACILITY: MINE  
 LATITUDE: N 27 54 22  
 PERCENT SHIPPED: 100  
 METHOD OF TRANSPORTATION: PIPELINE  
 DESTINATION FACILITY: MILL (ON-SITE)  
 LATITUDE: N 27 54 22

LOCATION: USA FLORIDA  
 LONGITUDE: W 81 55 12

DISTANCE (KM): 3.2  
 LOCATION: USA FLORIDA  
 LONGITUDE: W 81 55 12

**BENEFICIATION:**

METHOD: FLOTATION  
 TOTAL PERCENT USED: 89

----- DESCRIPTION OF MILLING -----  
 SLURRY/SCREEN/WASH/PEBBLE PRODUCT/  
 FLOAT/DRY/SHIP

**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY: MILL (ON-SITE)  
 LATITUDE: N 27 54 22  
 PERCENT SHIPPED: 69  
 METHOD OF TRANSPORTATION: CONVEYOR  
 DESTINATION FACILITY: REFINERY  
 LATITUDE: N 27 54 22

LOCATION: USA FLORIDA  
 LONGITUDE: W 81 55 12

DISTANCE (KM): 1.0  
 LOCATION: ON-SITE  
 LONGITUDE: W 81 55 12

**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY: MILL (ON-SITE)  
 LATITUDE: N 27 54 22  
 PERCENT SHIPPED: 20  
 METHOD OF TRANSPORTATION: RAIL  
 DESTINATION FACILITY: FCP PORT

LOCATION: USA FLORIDA  
 LONGITUDE: W 81 55 12

DISTANCE (KM): 70  
 LOCATION: TAMPA, FLORIDA (EXPORT)

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK  
ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: USA FLORIDA  
LATITUDE: N 27 54 22  
LONGITUDE: W 81 55 12  
PERCENT SHIPPED: 11  
DESTINATION FACILITY: FOB MILL LOCATION: DOMESTIC MARKETS

BIBLIOGRAPHY RECORDS

W.R. GRACE AND COMPANY. FLORIDA PHOSPHATE OPERATIONS. COMPANY PUBLICATION, 1977.

R.W. HOPPE. PHOSPHATES ARE VITAL TO AGRICULTURE AND FLORIDA MINES FOR ONE THIRD THE WORLD. IN E/MJ OPERATING HANDBOOK OF SURFACE MINING, McGRAW-HILL, INC., N.Y., 1976, PP. 382-392.

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: HOOKE'S PRAIRIE MINE

SEQUENCE NUMBER: 0121050007

NATION: USA STATE: FLORIDA

COUNTY: POLK

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 27 DEG 46 MIN 52 SEC

LONGITUDE: W 81 DEG 56 MIN 20 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

NORTHING: 3073137 EASTING: 407496

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 40 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDINGFEES OWNERSHIPOWNERSHIP

A. R. GRACE AND COMPANY

STATUS

OWNER-OPERATOR

COMMODITYMODIFIERMARKEABILITY

PRIMARY PRODUCT

PHOSPHATE

RECOVERABLE

FLUORINE

RECOVERABLE

URANIUM

URINE CONTENT

AFFECT MARKETABILITY

IRON

FERRIC OXIDE

AFFECT MARKETABILITY

ALUMINUM

ALUMINA

AFFECT MARKETABILITY

MAGNESIUM

OXIDE

AFFECT MARKETABILITY

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR POLK COUNTY, FLORIDA IS 2.0515 MILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 8.0% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATIONDISCOVERY METHOD:-----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

YEAR OF INITIAL PRODUCTION: 1977

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION:	BONE VALLEY FORMATION	GEOLOGIC AGE:	MIocene
ROCK TYPE:			
PHOSPHORITE	IS ORE		
SAND	GANGUE		
SILT	GANGUE		
CLAY	GANGUE		
DOLOMITE	LIES OVER ORE; GANGUE		

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORM OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**MINE/MILL INFORMATION****SURFACE MINING:**

METHOD:	STRIPPING	HARDNESS OF ORE:	
DESCRIPTION OF COVER:		QUICKSAND	
10 PERCENT SAND, SILT			
90 PERCENT QUICKSAND		SLOPE OF PIT:	65 DEGREES

**TRANSPORTATION (ORE):**

ORIGINATING FACILITY:	MINE	LOCATION:	USA FLORIDA
LATITUDE:	N 27 46 52	LONGITUDE:	W 81 56 20
PERCENT SHIPPED:	100		
METHOD OF TRANSPORTATION:	PIPELINE	DISTANCE (KM):	3.2
DESTINATION FACILITY:	MILL (ON-SITE)	LOCATION:	USA FLORIDA
LATITUDE:	N 27 46 52	LONGITUDE:	W 81 56 20

**PENEFICIATION:**

METHOD:	FLOTATION	----- DESCRIPTION OF MILLING -----	
TOTAL PERCENT USED:	97	SLURRY/SCREEN/WASH/PEBBLE PRODUCT/FLOAT/	
		DRY/SHIP	

**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY:	MILL (ON-SITE)	LOCATION:	USA FLORIDA
LATITUDE:	N 27 46 52	LONGITUDE:	W 81 56 20
PERCENT SHIPPED:	20		
METHOD OF TRANSPORTATION:	RAIL	DISTANCE (KM):	70
DESTINATION FACILITY:	FOB PORT	LOCATION:	TAMPA, FLORIDA (EXPORT)

**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY:	MILL (ON-SITE)	LOCATION:	USA FLORIDA
LATITUDE:	N 27 46 52	LONGITUDE:	W 81 56 20
PERCENT SHIPPED:	69		
METHOD OF TRANSPORTATION:	RAIL	DISTANCE (KM):	13
DESTINATION FACILITY:	REFINERY	LOCATION:	BARTOW, FLORIDA
LATITUDE:	N 27 54 22	LONGITUDE:	W 81 55 12

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK  
ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: USA FLORIDA  
LATITUDE: N 27 46 52 LONGITUDE: W 81 56 20  
PERCENT SHIPPED: 11  
DESTINATION FACILITY: FOB MILL LOCATION: DOMESTIC MARKETS

BIBLIOGRAPHY RECORDS

L.R. GRACE AND COMPANY. 1977 ANNUAL REPORT.

R.W. HOPPE. PHOSPHATES ARE VITAL TO AGRICULTURE AND FLORIDA MINES FOR ONE-THIRD THE WORLD. IN E/MJ OPERATING HANDBOOK OF SURFACE MINING, MCCRAW-HILL, INC. NEW YORK, NY, 1976, PP. 382-392.

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: NORALYN/PHOSPHORIA MINE      SEQUENCE NUMBER: 0121050008

NATION: USA      STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 49 MIN 30 SEC  
 UTM - ZONE: 17    HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 45 METERS  
 DATUM: SEA LEVEL

COUNTY: POLK  
 CURRENT STATUS: PRODUCER  
 LONGITUDE: W 81 DEG 54 MIN 00 SEC  
 NORTHING: 3077971    EASTING: 411363  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP

OWNERSHIP	STATUS
INTERNATIONAL MINERALS AND CHEMICAL CORPORATION	OWNER-OPERATOR

COMMODITY	MODIFIER	MARKEABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

MEASURED      RECORD 1  
 UNITS          32,090,000  
 YEAR/DATA      MT ORE  
 1981

## RESERVE/RESERVE - REMARKS

## SOURCE FOR RECORD 1:

ENGINEERING AND MINING JOURNAL. INTERNATIONAL DIRECTORY OF MINING.  
 1981. P. 192.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE  
 YEAR OF DISCOVERY: 1920  
 YEAR OF INITIAL PRODUCTION: 1948

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: BONE VALLEY FORMATION

GEOLOGIC AGE: MIOCENE

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORM OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
COLUMITE	CARBONATES	VARIABLE

MINE/MILL INFORMATION**SURFACE MINING:**

METHOD: STRIPPING

## DESCRIPTION OF COVEY:

10 PERCENT SAND, SILT  
90 PERCENT QUICKSAND**HARDNESS OF ORE:**

QUICKSAND

SLOPE OF PIT: 65 DEGREES

**TRANSPORTATION (ORE):**

ORIGINATING FACILITY: MINE

METHOD OF TRANSPORTATION: PIPELINE

DESTINATION FACILITY: MILL

LATITUDE: N 27 50 37

LOCATION: NORALYN MINE SITE

DISTANCE (KM): 3.2

LOCATION: NORALYN MILL

LONGITUDE: W 81 51 48

**TRANSPORTATION (ORE):**

ORIGINATING FACILITY: MINE

METHOD OF TRANSPORTATION: PIPELINE

DESTINATION FACILITY: WASH PLANT

LATITUDE: N 27 50 03

LOCATION: PHOSPHORIA MINE SITE

DISTANCE (KM): 3.2

LOCATION: PHOSPHORIA WASH PLANT

LONGITUDE: W 81 54 14

**TRANSPORTATION (ORE):**

ORIGINATING FACILITY: WASH PLANT

LATITUDE: N 27 50 03

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: PIPELINE

DESTINATION FACILITY: MILL

LATITUDE: N 27 50 37

LOCATION: PHOSPHORIA WASH PLANT

LONGITUDE: W 81 54 14

DISTANCE (KM): 6.4

LOCATION: NORALYN MILL

LONGITUDE: W 81 51 48

**BENEFICIATION:**

METHOD: FLOTATION

----- DESCRIPTION OF MILLING -----  
 SLURRY/SCREEN/RINSE/PEBBLE PRODUCT/  
 FEED TO FLOTATION/CLAY TO DISPOSAL

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK  
 ORIGINATING FACILITY: MILL LOCATION: NORALYN MILL  
 LATITUDE: N 27 50 37 LONGITUDE: W 81 51 48  
 PERCENT SHIPPED: 30  
 DESTINATION FACILITY: FOB MILL LOCATION: TAMPA, FLORIDA (EXPORT)

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK  
 ORIGINATING FACILITY: MILL LOCATION: NORALYN MILL  
 LATITUDE: N 27 50 37 LONGITUDE: W 81 51 48  
 PERCENT SHIPPED: 46  
 METHOD OF TRANSPORTATION: RAIL DISTANCE (KM): 17  
 DESTINATION FACILITY: REFINERY LOCATION: MULBERRY, FLORIDA

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK  
 ORIGINATING FACILITY: MILL LOCATION: NORALYN MILL  
 LATITUDE: N 27 50 37 LONGITUDE: W 81 51 48  
 PERCENT SHIPPED: 23  
 METHOD OF TRANSPORTATION: RAIL DISTANCE (KM): 8  
 DESTINATION FACILITY: REFINERY LOCATION: IMC'S NEW WALES CHEMICALS OPERATION

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK  
 ORIGINATING FACILITY: MILL LOCATION: NORALYN MILL  
 LATITUDE: N 27 50 37 LONGITUDE: W 81 51 48  
 PERCENT SHIPPED: 1  
 DESTINATION FACILITY: FOB MILL LOCATION: DOMESTIC MARKETS

#### BIBLIOGRAPHY RECORDS

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ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
 USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
 NTIS:  
 PB 286 648/AS, 1978. 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: KINGSFORD MINE

SEQUENCE NUMBER: 0121050009

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 50 MIN 02 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 40 METERS  
 DATUM: SEA LEVEL

COUNTY: POLK  
 CURRENT STATUS: PRODUCER  
 LONGITUDE: W 81 DEG 59 MIN 53 SEC  
 NORTHING: 3079029 EASTING: 401714  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP: PRIVATE LEASE

OWNERSHIP	INTERNATIONAL MINERALS AND CHEMICAL CORPORATION	STATUS
		OWNER-OPERATOR

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

MEASURED RECORD 1  
 UNITS 50,100,000  
 YEAR/DATA MT ORE  
 1981

## RESERVE/RESOURCE - REMARKS

## SOURCE FOR RECORD 1:

ENGINEERING AND MINING JOURNAL. INTERNATIONAL DIRECTORY OF MINING.  
 1981. P. 192.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE  
 YEAR OF DISCOVERY: 1920  
 YEAR OF INITIAL PRODUCTION: 1965

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION:	BONE VALLEY FORMATION	GEOLOGIC AGE:	MIocene
ROCK TYPE:			
PHOSPHORITE	IS ORE		
SAND	GANGUE		
SILT	GANGUE		
CLAY	GANGUE		
DOLOMITE	GANGUE		

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: STRIPPING  
 DESCRIPTION OF COVER:  
 100 PERCENT SAND, SILT

HARDNESS OF ORE:  
 QUICKSAND  
 SLOPE OF PIT: 60 DEGREES

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE  
 LATITUDE: N 27 50 02  
 PERCENT SHIPPED: 100  
 METHOD OF TRANSPORTATION: PIPELINE  
 DESTINATION FACILITY: MILL (ON-SITE)  
 LATITUDE: N 27 50 02

LOCATION: USA FLORIDA  
 LONGITUDE: W 81 59 53  
 DISTANCE (KM): 4.7  
 LOCATION: USA FLORIDA  
 LONGITUDE: W 81 59 53

## BENEFICIATION:

METHOD: FLOTATION

----- DESCRIPTION OF MILLING -----  
 ORE SLURRY, SCREEN/PEBBLE WET ROCK STORAGE/  
 FEED FLOTATION/CONCENTRATE WET ROCK STORAGE/  
 WASTE RECLAMATION-DISPOSAL

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: USA FLORIDA  
 LATITUDE: N 27 50 02 LONGITUDE: W 81 59 53  
 PERCENT SHIPPED: 30  
 DESTINATION FACILITY: FOB MILL LOCATION: TAMPA, FLORIDA (EXPORT)

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: USA FLORIDA  
 LATITUDE: N 27 50 02 LONGITUDE: W 81 59 53  
 PERCENT SHIPPED: 46  
 METHOD OF TRANSPORTATION: RAIL  
 DESTINATION FACILITY: REFINERY  
 LATITUDE: N 27 50 00 DISTANCE (KM): 11.2  
 LOCATION: BARTOW, FLORIDA  
 LONGITUDE: W 81 50 00

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK  
ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: USA FLORIDA  
LATITUDE: N 27 50 00 LONGITUDE: W 81 59 53  
PERCENT SHIPPED: 23  
METHOD OF TRANSPORTATION: RAIL DISTANCE (KM): 4.8  
DESTINATION FACILITY: REFINERY LOCATION: NEW WALES, FLORIDA  
LATITUDE: N 27 50 00 LONGITUDE: W 82 00 00

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK  
ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: USA FLORIDA  
LATITUDE: N 27 50 02 LONGITUDE: W 81 59 53  
PERCFT SHIPPED: 1  
DESTINATION FACILITY: FOB MILL LOCATION: DOMESTIC

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ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
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ATIS: FR 256 F48/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: CLEAR SPRINGS

SEQUENCE NUMBER: 0121050010

NATION: USA STATE: FLORIDA

COUNTY: POLK

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 27 DEG 51 MIN 11 SEC

LONGITUDE: W 81 DEG 48 MIN 29 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

NORTHING: 3081015 EASTING: 420439

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 40 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING

FEE OWNERSHIP; PRIVATE LEASE

OWNERSHIP

INTERNATIONAL MINERALS AND CHEMICAL CORPORATION

STATUS

OWNER-OPERATOR

COMMODITY

MODIFIER

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

FLUORINE

RECOVERABLE

URANIUM

RECOVERABLE

IRON

AFFECT MARKETABILITY

ALUMINUM

AFFECT MARKETABILITY

MAGNESIUM

AFFECT MARKETABILITY

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

MEASURED	RECORD 1 31,100,000
UNITS	MT ORE
YEAR/DATA	1981

## RESERVE/RESOURCE - REMARKS

SOURCE FOR RECORD 1:

ENGINEERING AND MINING JOURNAL. INTERNATIONAL DIRECTORY OF MINING.  
1981. P. 192.DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

YEAR OF INITIAL PRODUCTION: 1948

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: PINE VALLEY FORMATION

GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORM OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**MINE/MILL INFORMATION****SURFACE MINING:**

METHOD: STRIPPING

DESCRIPTION OF COVER:  
10 PERCENT SAND, SILT  
90 PERCENT QUICKSANDHARDNESS OF ORE:  
QUICKSAND

SLOPE OF PIT: 65 DEGREES

**TRANSPORTATION (ORE):**

ORIGINATING FACILITY: MINE

LOCATION: CLEAR SPRINGS, FLORIDA

LATITUDE: N 27 51 11

LONGITUDE: W 81 48 29

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: PIPELINE

DISTANCE (KM): 3.2

DESTINATION FACILITY: MILL (ON-SITE)

LOCATION: CLEAR SPRINGS, FLORIDA

LATITUDE: N 27 51 11

LONGITUDE: W 81 48 29

**BENEFICIATION:**

METHOD: FLOTATION

----- DESCRIPTION OF MILLING -----  
SLURRY/SCREEN/WASH/PEBBLE PRODUCT/FLOAT/  
CLAY TO TAILS**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY: MILL (ON-SITE)

LOCATION: CLEAR SPRINGS, FLORIDA

LATITUDE: N 27 51 11

LONGITUDE: W 81 48 29

PERCENT SHIPPED: 30

DESTINATION FACILITY: FOB PORT

LOCATION: TAMPA, FLORIDA (EXPORT)

**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY: MILL (ON-SITE)

LOCATION: CLEAR SPRINGS, FLORIDA

LATITUDE: N 27 51 11

LONGITUDE: W 81 48 29

PERCENT SHIPPED: 46

METHOD OF TRANSPORTATION: RAIL

DISTANCE (KM): 6

DESTINATION FACILITY: REFINERY

LOCATION: CENTRAL FARMERS' CHEMICAL  
FACILITY

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: CLEAR SPRINGS, FLORIDA

LATITUDE: N 27 51 11 LONGITUDE: W 81 48 29

PERCENT SHIPPED: 23

METHOD OF TRANSPORTATION: RAIL

DISTANCE (KM): 16

DESTINATION FACILITY: REFINERY

LOCATION: IMC'S NEW WALES CHEMICALS  
OPERATION

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: CLEAR SPRINGS, FLORIDA

LATITUDE: N 27 51 11 LONGITUDE: W 81 48 29

PERCENT SHIPPED: 1

DESTINATION FACILITY: FOB MILL

LOCATION: DOMESTIC MARKETS

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NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: NICHOLS MINE

SEQUENCE NUMBER: 0121050011

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 50 MIN 26 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 35 METERS  
 DATUM: SEA LEVEL

COUNTY: POLK  
 CURRENT STATUS: PRODUCER  
 LONGITUDE: W 82 DEG 00 MIN 54 SEC  
 NORTHING: 3083474 EASTING: 400082  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIPOWNERSHIP  
MOBIL CHEMICAL COMPANYSTATUS  
OWNER-OPERATOR

COMMODITY	MODIFIER
PHOSPHATE	
FLUORINE	
URANIUM	U308 CONTENT
IRON	FERRIC OXIDE
ALUMINUM	ALUMINA
MAGNESIUM	OXIDE
WATER CONTENT	FREE WATER

MARKETABILITY
PRIMARY PRODUCT
RECOVERABLE
RECOVERABLE
AFFECT MARKETABILITY
AFFECT MARKETABILITY
AFFECT MARKETABILITY

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 PESERVE TONNAGE FOR POLK COUNTY, FLORIDA IS 2.519 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 8.0% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----  
CORE DRILLING

GEOLOGICAL INFERENCE

YEAR OF DISCOVERY: 1915

YEAR OF INITIAL PRODUCTION: 1970

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION:	BONE VALLEY FORMATION	GEOLOGIC AGE:	MIocene
ROCK TYPE:			
PHOSPHORITE	IS ORE		
SAND	GANGUE		
SILT	GANGUE		
CLAY	GANGUE		
DOLOMITE	GANGUE		

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORM OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD:	STRIPPING	HARDNESS OF ORE:	
DESCRIPTION OF COVER:		QUICKSAND	
10 PERCENT SAND, SILT			
90 PERCENT QUICKSAND		SLOPE OF PIT: 60 DEGREES	

## TRANSPORTATION (ORE):

ORIGINATING FACILITY:	MINE	LOCATION:	NICHOLS, FLORDIA
LATITUDE:	N 27 52 26	LONGITUDE:	W 82 00 54
PERCENT SHIPPED:	100		
METHOD OF TRANSPORTATION:	PIPELINE	DISTANCE (KM):	3.2
DESTINATION FACILITY:	MILL (ON-SITE)	LOCATION:	NICHOLS, FLORIDA
LATITUDE:	N 27 52 26	LONGITUDE:	W 82 00 54

## BENEFICIATION:

METHOD:	FLOTATION	----- DESCRIPTION OF MILLING -----
		SLURRY/SCREEN/RINSE/PEBBLE PRODUCT/
		FEED TO FLOTATION/CLAY TO DISPOSAL

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY:	MILL (ON-SITE)	LOCATION:	NICHOLS, FLORIDA
LATITUDE:	N 27 52 26	LONGITUDE:	W 82 00 54
METHOD OF TRANSPORTATION:	RAIL	DISTANCE (KM):	20
DESTINATION FACILITY:	REFINERY	LOCATION:	BARTOW, FLORIDA

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY:	MILL (ON-SITE)	LOCATION:	NICHOLS, FLORIDA
LATITUDE:	N 27 52 26	LONGITUDE:	W 82 00 54
METHOD OF TRANSPORTATION:	RAIL; RIVER	DISTANCE (KM):	60; 2040
DESTINATION FACILITY:	REFINERY	LOCATION:	DEPUE, ILLINOIS

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK  
ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: NICHOLS, FLORIDA  
LATITUDE: N 27 52 26 LONGITUDE: W 82 00 54  
DESTINATION FACILITY: FOB MILL LOCATION: DOMESTIC MARKETS

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ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SOUTH FCRT MEADE MINE SEQUENCE NUMBER: 0121050012

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 40 MIN 30 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 45 METERS  
 DATUM: SEA LEVEL

COUNTY: POLK  
 CURRENT STATUS: DEVELOPING DEPOSIT  
 LONGITUDE: W 81 DEG 44 MIN 28 SEC  
 NORTHING: 3061250 EASTING: 426912  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP; PRIVATE LEASE

OWNERSHIP  
 MOBIL CHEMICAL COMPANY  
 COASTAL CHEMICAL CORPORATION  
 TENNESSEE VALLEY AUTHORITY  
 SMALL LANDOWNERS

STATUS  
 OWNER-OPERATOR  
 OWNER  
 OWNER  
 OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR POLK COUNTY, FLORIDA IS 2.519 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 8.0% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. P. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUSINESS I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE  
 YEAR OF DISCOVERY: 1960

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION: ONE VALLEY FORMATION                    GEOLOGIC AGE: MIocene  
ROCK TYPE:  
PHOSPHORITE    IS ORE  
SAND    GANGUE  
SILT    GANGUE  
CLAY    GANGUE  
DOLOMITE    GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
CLLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLomite	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA,  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PU 28E 64c/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: FORT MEADE MINE (MOBIL) SEQUENCE NUMBER: 0121050013

NATION: USA	STATE: FLORIDA	COUNTY: POLK
TYPE OF OPERATION: SURFACE		CURRENT STATUS: PRODUCER
LATITUDE: N 27 DEG 47 MIN 20 SEC		LONGITUDE: W 81 DEG 47 MIN 49 SEC
UTM - ZONE: 17	HEMISPHERE: NORTHERN	NORTHING: 3073899 EASTING: 421487
POINT OF REFERENCE: ORE BODY		PRECISION: 100 METERS
ELEVATION: 36 METERS		PRECISION: 10 METERS
DATUM: SEA LEVEL		YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

OWNERSHIP	STATUS
MOBIL CHEMICAL COMPANY	OWNER-OPERATOR

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR POLK COUNTY, FLORIDA IS 2.519 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 8.0% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:	-----EXPLORATION METHODS-----
GEOLOGICAL INFERENCE	CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY:	SEDIMENTARY; DISSEMINATED; REPLACEMENT
MODE OF ORIGIN:	SEDIMENTATION; RESIDUAL CONCENTRATION
SHAPE OF ORE BODY:	MASSIVE; IRREGULAR
CONTROLLING FEATURES:	LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION:	PINE VALLEY FORMATION	GEOLOGIC AGE:	MIocene
ROCK TYPE:			
PHOSPHORITE	IS ORE		
SAND	GANGUE		
SILT	GANGUE		
CLAY	GANGUE		
DOLOMITE	GANGUE		

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**MINE/MILL INFORMATION****SURFACE MINING:**

METHOD:	STRIPPING	HARDNESS OF ORE:	
DESCRIPTION OF COVER:		QUICKSAND	
100 PERCENT SAND, SILT		SLOPE OF PIT:	60 DEGREES

**TRANSPORTATION (ORE):**

ORIGINATING FACILITY:	MINE	LOCATION:	USA FLORIDA
LATITUDE:	N 27 41 20	LONGITUDE:	W 81 47 49
PERCENT SHIPPED:	100		
METHOD OF TRANSPORTATION:	PIPELINE	DISTANCE (KM):	3.2
DESTINATION FACILITY:	MILL (ON-SITE)	LOCATION:	USA FLORIDA
LATITUDE:	N 27 41 20	LONGITUDE:	W 81 47 49

**BENEFICIATION:**

METHOD:	FLOTATION	----- DESCRIPTION OF MILLING -----
		ORE SLURRY/SCREEN/PEBBLE WET ROCK STORAGE/
		FEED FLOTATION/CONCENTRATE WET ROCK STORAGE/
		WASTE/RECLAMATION-DISPOSAL

**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY:	MILL (ON-SITE)	LOCATION:	USA FLORIDA
LATITUDE:	N 27 41 20	LONGITUDE:	W 81 47 49
METHOD OF TRANSPORTATION:	RAIL; RIVER	DISTANCE (KM):	60; 2400
DESTINATION FACILITY:	REFINERY	LOCATION:	DEPUE, ILLINOIS
LATITUDE:	N 41 20 00	LONGITUDE:	W 89 15 00

**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY:	MILL (ON-SITE)	LOCATION:	USA FLORIDA
LATITUDE:	N 27 41 20	LONGITUDE:	W 81 47 49
METHOD OF TRANSPORTATION:	RAIL	DISTANCE (KM):	20
DESTINATION FACILITY:	REFINERY	LOCATION:	BARTOW, FLORIDA
LATITUDE:	N 27 50 00	LONGITUDE:	W 81 50 00

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK  
ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: USA FLORIDA  
LATITUDE: N 27 41 20 LONGITUDE: W 81 47 49  
DESTINATION FACILITY: FOB MILL

BIBLIOGRAPHY RECORDS

THE ARCADIAN. PHOSPHATE WASTES LEAKED INTO RIVER. MARCH 6, 1975.

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: WATSON MINE

SEQUENCE NUMBER: 0121050014

NATION: USA STATE: FLORIDA

TYPE OF OPERATION: SURFACE

LATITUDE: N 27 DEG 43 MIN 30 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

POINT OF REFERENCE: ORE BODY

ELEVATION: 35 METERS

DATUM: SEA LEVEL

COUNTY: POLK

CURRENT STATUS: PRODUCER

LONGITUDE: W 81 DEG 48 MIN 40 SEC

NORTHING: 3066832 EASTING: 420045

PRECISION: 100 METERS

PRECISION: 10 METERS

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING

FEE OWNERSHIP

OWNERSHIP

ESTECH GENERAL CHEMICALS CORPORATION

STATUS

OWNER-OPERATOR

COMMODITY

MODIFIER

MARKETABILITY

PRIMARY PRODUCT

PHOSPHATE

RECOVERABLE

FLUORINE

RECOVERABLE

URANIUM

U308 CONTENT

AFFECT MARKETABILITY

IRON

FERRIC OXIDE

AFFECT MARKETABILITY

ALUMINUM

ALUMINA

AFFECT MARKETABILITY

MAGNESIUM

OXIDE

AFFECT MARKETABILITY

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR POLK COUNTY, FLORIDA IS 2.51<sup>4</sup> BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 8.0% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

YEAR OF DISCOVERY: 1906

YEAR OF INITIAL PRODUCTION: 1936

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: BONE VALLEY FORMATION                    GEOLOGIC AGE: MIocene  
 ROCK TYPE:  
 PHOSPHORITE    IS ORE  
 SAND    GANGUE  
 SILT    GANGUE  
 CLAY    GANGUE  
 DOLOMITE    GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORM OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**MINE/MILL INFORMATION****SURFACE MINING:**

METHOD: STRIPPING  
 DESCRIPTION OF COVER:  
 10 PERCENT SAND, SILT  
 90 PERCENT QUICKSAND

HARDNESS OF ORE:  
 QUICKSAND  
 SLOPE OF PIT: 65 DEGREES

**TRANSPORTATION (ORE):**

ORIGINATING FACILITY: MINE  
 LATITUDE: N 27 43 30  
 PERCENT SHIPPED: 100  
 METHOD OF TRANSPORTATION: PIPELINE  
 DESTINATION FACILITY: MILL (ON-SITE)  
 LATITUDE: N 27 43 30

LOCATION: USA FLORIDA  
 LONGITUDE: W 81 48 40  
 DISTANCE (KM): 3.2  
 LOCATION: USA FLORIDA  
 LONGITUDE: W 81 48 40

**BENEFICIATION:**

METHOD: FLOTATION

----- DESCRIPTION OF MILLING -----  
 SLURRY/SCREEN/RINSE/PEBBLE PRODUCT/  
 FEED TO FLOTATION/CLAY TO DISPOSAL

**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY: MILL (ON-SITE)  
 LATITUDE: N 27 43 30  
 PERCENT SHIPPED: 76  
 DESTINATION FACILITY: FOB MILL

LOCATION: USA FLORIDA  
 LONGITUDE: W 81 48 40  
 LOCATION: TAMPA, FL (EXPORT)

**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY: MILL (ON-SITE)  
 LATITUDE: N 27 43 30  
 PERCENT SHIPPED: 22  
 DESTINATION FACILITY: FOB MILL

LOCATION: USA FLORIDA  
 LONGITUDE: W 81 48 40  
 LOCATION: DOMESTIC

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK  
ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: USA FLORIDA  
LATITUDE: N 27 43 30 LONGITUDE: W 81 48 40  
PERCENT SHIPPED: 2  
DESTINATION FACILITY: REFINERY LOCATION: INTERNAL CONSUMPTION

BIBLIOGRAPHY RECORDS

SWIFT AGRICULTURAL CHEMICALS CORPORATION. 1976 ANNUAL REPORT.

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINFS OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SILVER CITY MINE	SEQUENCE NUMBER: 0121050015
NATION: USA STATE: FLORIDA	COUNTY: POLK
TYPE OF OPERATION: SURFACE	CURRENT STATUS: PRODUCER
LATITUDE: N 27 DEG 48 MIN 00 SEC	LONGITUDE: W 81 DEG 54 MIN 11 SEC
UTM - ZONE: 17 HEMISPHERE: NORTHERN	NORTHING: 3075203 EASTING: 411042
POINT OF REFERENCE: ORE BODY	PRECISION: 100 METERS
ELEVATION: 50 METERS	PRECISION: 10 METERS
DATUM: SEA LEVEL	YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

OWNERSHIP	STATUS
ESTECH GENERAL CHEMICALS CORPORATION	OWNER-OPERATOR

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR POLK COUNTY, FLORIDA IS 2.519 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 8.0% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:	-----EXPLORATION METHODS-----
GEOLOGICAL INFERENCE	CORE DRILLING
YEAR OF DISCOVERY: 1906	

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: BONE VALLEY FORMATION

GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	CANGUE
SILT	CANGUE
CLAY	CANGUE
DOLOMITE	CANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FUMS OF SiO <sub>2</sub>	VARIABLE
CELLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**MINE/MILL INFORMATION****SURFACE MINING:**

METHOD: STRIPPING

## DESCRIPTION OF COVER:

10 PERCENT SAND, SILT  
90 PERCENT QUICKSAND

## HARDNESS OF ORE:

QUICKSAND

SLOPE OF PIT: 65 DEGREES

**TRANSPORTATION (ORE):**

ORIGINATING FACILITY: MINE

LOCATION: USA FLORIDA

LATITUDE: N 27 48 00

LONGITUDE: W 81 54 11

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: PIPELINE

DISTANCE (KM): 3.2

DESTINATION FACILITY: MILL (ON-SITE)

LOCATION: USA FLORIDA

LATITUDE: N 27 48 00

LONGITUDE: W 81 54 11

**ENRICHMENT:**

METHOD: FLOTATION

## ----- DESCRIPTION OF MILLING -----

SLURRY/SCREEN/RINSE/PEBBLE PRODUCT/  
FEED TO FLOTATION/CLAY TO DISPOSAL**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: USA FLORIDA

LATITUDE: N 27 48 00 LONGITUDE: W 81 54 11

PERCENT SHIPPED: 76

DESTINATION FACILITY: FOB MILL

LOCATION: EXPORT

**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: USA FLORIDA

LATITUDE: N 27 48 00 LONGITUDE: W 81 54 11

PERCENT SHIPPED: 22

DESTINATION FACILITY: FOB MILL

LOCATION: DOMESTIC

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK  
ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: USA FLORIDA  
LATITUDE: N 27 48 00 LONGITUDE: W 81 54 11  
PERCENT SHIPPED: 2  
DESTINATION FACILITY: REFINERY LOCATION: INTERNAL CONSUMPTION

BIBLIOGRAPHY RECORDS

SWIFT AGRICULTURAL CHEMICALS CORPORATION. 1977 ANNUAL REPORT.

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PR 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: LITTLE FAYNE CREEK

SEQUENCE NUMBER: 0121050016

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 37 MIN 25 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 74 METERS  
 DATUM: SEA LEVEL

COUNTY: POLK  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 81 DEG 52 MIN 25 SEC  
 NORTHING: 3055643 EASTING: 413804  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP: MINERALS ONLY;  
 PRIVATE LEASE

ALTERNATE NAMES  
 NORTH HARDEF DEPOSIT  
 SMALL TRACTS GARDINIER USSAC AREA

OWNERSHIP  
 UNITED STATES STEEL AGRI-CHEMICALS  
 GARDINIER INC.  
 150 SMALL LANDOWNERS

STATUS  
 OWNER-OPERATOR  
 OWNER  
 OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR POLK COUNTY, FLORIDA IS 2.519 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 8.0% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTL, R. J., C. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PROGS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE  
 YEAR OF DISCOVERY: 1950

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION: BONE VALLEY FORMATION                    GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

ZELLAR-WILLIAMS, INC. EVALUATION OF THE PHOSPHATE DEPOSITS  
OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEMS. BUMINES  
OPEN FILE REPORT 112-78, NTIS:PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: ROCKLAND MINE

SEQUENCE NUMBER: 0121050017

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 45 MIN 14 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 50 METERS  
 DATUM: SEA LEVEL

COUNTY: POLK  
 CURRENT STATUS: PRODUCER  
 LONGITUDE: W 81 DEC 52 MIN 01 SEC  
 NORTHING: 3070069 EASTING: 414563  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP

OWNERSHIP  
 UNITED STATES STEEL AGRI-CHEMICALS  
 FREEPORT PHOSPHATE ROCK COMPANY

STATUS  
 OWNER-OPERATOR  
 OWNER

COMMODITY	MODIFIER
PHOSPHATE	
FLUORINE	
URANIUM	U3O8 CONTENT
IRON	FERRIC OXIDE
ALUMINUM	ALUMINA
MAGNESIUM	OXIDE
WATER CONTENT	FREE WATER

MARKETABILITY  
 PRIMARY PRODUCT  
 RECOVERABLE  
 RECOVERABLE  
 AFFECT MARKETABILITY  
 AFFECT MARKETABILITY  
 AFFECT MARKETABILITY

PUBLISHED RESERVE-RESOURCE INFORMATION

RECORD 1  
 MEASURED 18,000,000  
 INDICATED 23,000,000  
 UNITS MT ORE  
 YEAR/DATA 1981

RESERVE/RESOURCE - REMARKS

SOURCE FOR RECORD 1:

ENGINEERING AND MINING JOURNAL. INTERNATIONAL DIRECTORY OF  
MINING. 1981, P. 190.DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE  
 YEAR OF DISCOVERY: 1920  
 YEAR OF INITIAL PRODUCTION: 1968

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: DEPOSITION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION:	BONE VALLEY FORMATION	GEOLOGIC AGE:	MIocene
ROCK TYPE:			
PHOSPHORITE	IS ORE		
SAND	GANGUE		
SILT	GANGUE		
CLAY	GANGUE		
DOLOMITE	GANGUE		

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SIO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**MINE/MILL INFORMATION****SURFACE MINING:**

METHOD:	STRIPPING	HARDNESS OF ORE:	
DESCRIPTION OF COVER:		QUICKSAND	
10 PERCENT SAND, SILT		SLOPE OF PIT:	65 DEGREES
90 PERCENT QUICKSAND			

**TRANSPORTATION (ORE):**

ORIGINATING FACILITY:	MINE	LOCATION:	USA FLORIDA
LATITUDE:	N 27 45 14	LONGITUDE:	W 81 52 01
PERCENT SHIPPED:	100		
METHOD OF TRANSPORTATION:	PIPELINE	DISTANCE (KM):	3.2
DESTINATION FACILITY:	MILL (ON-SITE)	LOCATION:	USA FLORIDA
LATITUDE:	N 27 45 14	LONGITUDE:	W 81 52 01

**BENEFICIATION:**

METHOD:	FLOTATION	----- DESCRIPTION OF MILLING -----	
		SLURRY/SCREEN/RINSE/PEBBLE PRODUCT/	
		FEED FLOTATION/CLAY TO DISPOSAL	

**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY:	MILL (ON-SITE)	LOCATION:	USA FLORIDA
LATITUDE:	N 27 45 14	LONGITUDE:	W 81 52 01
PERCENT SHIPPED:	50		
METHOD OF TRANSPORTATION:	RAIL; OCEAN	DISTANCE (KM):	76; 550
DESTINATION FACILITY:	REFINERY	LOCATION:	USA LOUISIANA
LATITUDE:	N 30 00 00	LONGITUDE:	W 90 55 00

**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY:	MILL (ON-SITE)	LOCATION:	USA FLORIDA
LATITUDE:	N 27 45 14	LONGITUDE:	W 81 52 01
PERCENT SHIPPED:	50		
DESTINATION FACILITY:	REFINERY	LOCATION:	USA FLORIDA
LATITUDE:	N 27 45 14	LONGITUDE:	W 81 52 01

BIBLIOGRAPHY RECORDS

ENGINEERING AND MINING JOURNAL. INTERNATIONAL DIRECTORY OF MINING.  
1981 • P. 190.

ZELLAR-WILLIAMS, INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEMS. BUMINES OPEN FILE REPORT  
112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: FORT MEADE MINE  
 (GARDINIER)

NATION: USA STATE: FLORIDA

TYPE OF OPERATION: SURFACE

LATITUDE: N 27 DEG 41 MIN 13 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

POINT OF REFERENCE: ORE BODY

ELEVATION: 40 METERS

DATUM: SEA LEVEL

SEQUENCE NUMBER: 0121050019

COUNTY: POLK

CURRENT STATUS: PRODUCER

LONGITUDE: W 81 DEG 50 MIN 49 SEC

NORTHING: 3062640 EASTING: 416483

PRECISION: 100 METERS

PRECISION: 10 METERS

YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP

ALTERNATE NAMES  
 TENCOR MINE

OWNERSHIP	STATUS	
GARDINIER INC.	OWNER-OPERATOR	
COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR POLK COUNTY, FLORIDA IS 2.519 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 8.0% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE

YEAR OF INITIAL PRODUCTION: 1967

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION:	BONE VALLEY FORMATION	GEOLOGIC AGE:	MIocene
ROCK TYPE:			
PHOSPHORITE	IS ORE		
SAND	GANGUE		
SILT	GANGUE		
CLAY	GANGUE		
DOLOMITE	GANGUE		

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
GUAYTL	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: STRIPPING  
 DESCRIPTION OF COVER:  
 10 PERCENT SAND, SILT  
 90 PERCENT QUICKSAND  
 PERCENT WASTE ROCK: 46.6

HARDNESS OF ORE:  
 QUICKSAND  
 SLOPE OF PIT: 65 DEGREES

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE  
 LATITUDE: N 27 41 13  
 PERCENT SHIPPED: 100  
 METHOD OF TRANSPORTATION: PIPELINE  
 DESTINATION FACILITY: MILL (ON-SITE)  
 LATITUDE: N 27 41 13

LOCATION: USA FLORIDA  
 LONGITUDE: W 81 50 49  
 DISTANCE (KM): 4.8  
 LOCATION: USA FLORIDA  
 LONGITUDE: W 81 50 49

## BENEFICIATION:

METHOD: FLUTATION

----- DESCRIPTION OF MILLING -----  
 SLURRY/SCREEN/RINSE/PEBBLE PRODUCT/  
 FEED TO FLOTATION/CLAY TO DISPOSAL

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE)	LOCATION: USA FLORIDA
LATITUDE: N 27 41 13	LONGITUDE: W 81 50 49
PERCENT SHIPPED: 100	DISTANCE (KM): 107
METHOD OF TRANSPORTATION: PAIL	LOCATION: TAMPA, FLORIDA
DESTINATION FACILITY: REFINERY	LONGITUDE: W 82 40 00
LATITUDE: N 28 00 00	

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS, INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: POLK COUNTY MINE  
 NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 27 DEG 51 MIN 22 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 40 METERS  
 DATUM: SEA LEVEL

SEQUENCE NUMBER: 0121050020  
 COUNTY: POLK  
 CURRENT STATUS: PRODUCER  
 LONGITUDE: W 81 DEG 58 MIN 37 SEC  
 NORTHING: 3081475 EASTING: 403813  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIPALTERNATE NAMES

OLD ACHAN (IMC) DEEPIS AND MATRIX  
 T/A MINERALS POLK COUNTY MINE

OWNERSHIP  
 TRANS AMMONIA MINERALS CORPORATION

STATUS  
 OWNER-OPERATOR

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR POLK COUNTY, FLORIDA IS 2.519 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 8.0% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 ORE-MINERAL IN PLACE  
 YEAR OF DISCOVERY: 1974  
 YEAR OF INITIAL PRODUCTION: 1976

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: IRREGULAR; MASSIVE  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION:	BONE VALLEY FORMATION	GEOLOGIC AGE:	MIOCENE
ROCK TYPE:			
PHOSPHORITE	IS ORE		
SAND	GANGUE		
CLAY	GANGUE		
SILT	GANGUE		
DOLOMITE	GANGUE		

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD:	STRIPPING	HARDNESS OF ORE:
DESCRIPTION OF COVER:		SAND, SILT
100 PERCENT SAND, SILT		
PERCENT WASTE ROCK:	57.5	SLOPE OF PIT: 65 DEGREES

## TRANSPORTATION (ORE):

ORIGINATING FACILITY:	MINE	LOCATION:	MULBERRY, FLORIDA
LATITUDE:	N 27 51 22	LONGITUDE:	W 81 58 37
PERCENT SHIPPED:	100		
METHOD OF TRANSPORTATION:	PIPELINE	DISTANCE (KM):	3.2
DESTINATION FACILITY:	MILL (ON-SITE)	LOCATION:	MULBERRY FLORIDA
LATITUDE:	N 27 51 22	LONGITUDE:	W 81 58 37

## BENEFICIATION:

METHOD:	FLOTATION	----- DESCRIPTION OF MILLING -----
		SLURRY/SCREEN/RINSE/PEBBLE PRODUCT/
		FEED TO FLOTATION/CLAY TO DISPOSAL

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY:	MILL (ON-SITE)	LOCATION:	MULBERRY, FLORIDA
LATITUDE:	N 27 51 22	LONGITUDE:	W 81 58 37
PERCENT SHIPPED:	100		
METHOD OF TRANSPORTATION:	RAIL	DISTANCE (KM):	11
DESTINATION FACILITY:	REFINERY	LOCATION:	BARTOW, FLORIDA

BIBLIOGRAPHY RECORDS

HOPPE, R. W. PHOSPHATES ARE VITAL TO AGRICULTURE AND FLORIDA MINES FOR ONE THIRD THE WORLD. IN E/MJ OPERATING HANDBOOK OF SURFACE MINING, MCGRAW-HILL, INC. NEW YORK, NY, 1976, PP. 382-392.

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: FRIDOVICH

SEQUENCE NUMBER: 0121050023

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 28 DEG 00 MIN 40 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: CRE BODY  
 ELEVATION: 41 METERS  
 DATUM: SEA LEVEL

COUNTY: POLK  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 82 DEG 01 MIN 15 SEC  
 NORTHING: 3098681 EASTING: 399634  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP

ALTERNATE NAMES  
 LAKELAND AIRPORT  
 DRANE FIELD TRACT  
 WEST LAKELAND VENTURE

OWNERSHIP  
 AGRI-LEIS CORPORATION

STATUS  
 OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABLILITY
ALUMINUM	ALUMINA	AFFECT MARKETABLILITY
MAGNESIUM	OXIDE	AFFECT MARKETABLILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR POLK COUNTY, FLORIDA IS 2.519 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 8.0% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE  
 YEAR OF DISCOVERY: 1936

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION: BONE VALLEY FORMATION                    GEOLOGIC AGE: MIocene  
ROCK TYPE:  
PHOSPHORITE                    IS ORE  
SAND                            GANGUE  
SILT                            GANGUE  
CLAY                            GANGUE  
DOLOMITE                      GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS, INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: CHRISTINA RESERVE

SEQUENCE NUMBER: 0121050024

NATION: USA STATE: FLORIDA

COUNTY: POLK

TYPE OF OPERATION: SURFACE

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 27 DEG 56 MIN 40 SEC

LONGITUDE: W 82 DEG 00 MIN 10 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

NORTHING: 3091280 EASTING: 401349

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 35 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING

FEE OWNERSHIP

OWNERSHIP

MOBIL CHEMICAL COMPANY

STATUS

OWNER

COMMODITY

MODIFIER

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

FLUORINE

RECOVERABLE

URANIUM

RECOVERABLE

IRON

AFFECT MARKETABILITY

ALUMINUM

AFFECT MARKETABILITY

MAGNESIUM

AFFECT MARKETABILITY

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR POLK COUNTY, FLORIDA IS 2.519 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 8.0% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING

YEAR OF DISCOVERY: 1930

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: BONE VALLEY FORMATION

GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLUPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLomite	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ZELLARS-WILLIAMS, INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PU 28E 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: ST JOHN'S COUNTY DEPOSIT      SEQUENCE NUMBER: 0121090001

NATION: USA      STATE: FLORIDA  
 TYPE OF OPERATION: PROSPECT  
 LATITUDE: N 30 DEG 03 MIN 47 SEC  
 UTM - ZONE: 17      HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 13 METERS  
 DATUM: SEA LEVEL

COUNTY: ST JOHN'S  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 81 DEG 27 MIN 22 SEC  
 NORTHING: 3325679      EASTING: 456035  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP; MINERALS ONLY;  
 PRIVATE LEASE

OWNERSHIP  
 AGRICO CHEMICAL COMPANY  
 MOBIL (CONTAINER CORPORATION)  
 VARIOUS UNIDENTIFIED OWNERS

STATUS  
 OWNER  
 OWNER  
 OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR NORTHERN, EAST COAST, AND HARD ROCK DISTRICTS IN FLORIDA IS 10.507 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.46% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB28E 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE  
 YEAR OF DISCOVERY: 1965

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION: HAWTHORN FORMATION

GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE IS ORE

SAND GANGUE

SILT GANGUE

CLAY GANGUE

DOLOMITE GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLICIFERATE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

U. S. GEOLOGICAL SURVEY. LAND-USE LAND COVER MAP, JACKSONVILLE. U. S. GEOL. SURVEY OPEN FILE 76-031-1, 1972.

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 78-648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SARASOTA COUNTY DEPOSIT NO. 1 SEQUENCE NUMBER: 0121150001

NATION: USA	STATE: FLORIDA	COUNTY: SARASOTA
TYPE OF OPERATION: SURFACE		CURRENT STATUS: EXPLORED DEPOSIT
LATITUDE: N 27 DEG 06 MIN 50 SEC		LONGITUDE: W 82 DEG 06 MIN 29 SEC
UTM - ZONE: 17	HEMISPHERE: NORTHERN	NCRTHING: 2999364 EASTING: 390169
POINT OF REFERENCE: ORE BODY		PRECISION: 100 METERS
ELEVATION: 10 METERS		PRECISION: 10 METERS
DATUM: SEA LEVEL		YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

OWNERSHIP	STATUS
GEORGE KELCE	OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR DESOTO AND SARASOTA COUNTIES, FLORIDA IS 1.175 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.9% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I.C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATIONDISCOVERY METHOD:  
GEOLOGICAL INFERENCE-----EXPLORATION METHODS-----  
CORE DRILLINGGEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: HAWTHORN/BONE VALLEY FORMATIONS

GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SIO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SARASOTA COUNTY DEPOSIT NO. 2      SEQUENCE NUMBER: 0121150002

NATION: USA	STATE: FLORIDA	COUNTY: SARASOTA
TYPE OF OPERATION: SURFACE		CURRENT STATUS: EXPLORED DEPOSIT
LATITUDE: N 27 DEG 11 MIN 10 SEC		LONGITUDE: W 82 DEG 09 MIN 14 SEC
UTM - ZONE: 17	HEMISPHERE: NORTHERN	NORTHING: 3007406 EASTING: 385699
POINT OF REFERENCE: ORE BODY		PRECISION: 100 METERS
ELEVATION: 12 METERS		PRECISION: 10 METERS
DATUM: SEA LEVEL		YEAR OF INFORMATION: 1979

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR MANATEE, SARASOTA, AND DESOTO COUNTIES, FLORIDA IS 8.447 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 4.5% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCES: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB 286 648/AS, 1978, 195 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
GEOLOGICAL INFERENCE

-----EXPLORATION METHODS-----  
GEOLOGICAL INFERENCE

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: HAWTHORN FORMATION

GEOLOGIC AGE: MIocene

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGLE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

BIBLIOGRAPHY RECORDS

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: LIVE OAK DEPOSIT

SEQUENCE NUMBER: 0121210004

NATION: USA STATE: FLORIDA

COUNTY: SUWANNEE

TYPE OF OPERATION: PROSPECT

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 30 DEG 13 MIN 26 SEC

LONGITUDE: W 83 DEG 54 MIN 00 SEC

UTM - ZONE: 17 HEMISPHERE: NORTHERN

NORTHING: 3346970 EASTING: 220866

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 50 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

COMMODITY MODIFIER

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

FLUORINE

RECOVERABLE

URANIUM

RECOVERABLE

IRON

AFFECT MARKETABILITY

ALUMINUM

AFFECT MARKETABILITY

MAGNESIUM

AFFECT MARKETABILITY

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR NORTHERN, EAST COAST, AND HARD ROCK DISTRICTS IN FLORIDA IS 10.507 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.46% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB286 648/AS, 1978, 199 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

GEOLOGICAL INFERENCE

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: HAWTHORN FORMATION      GEOLOGIC AGE: MIocene  
ROCK TYPE:  
PHOSPHORITE IS ORE  
SAND GANGUE  
SILT GANGUE  
CLAY GANGUE  
DOLOMITE GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA  
USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78,  
NTIS: PB 286 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: MCALPIN DEPOSIT

SEQUENCE NUMBER: 0121210005

NATION: USA STATE: FLORIDA  
 TYPE OF OPERATION: PROSPECT  
 LATITUDE: N 30 DEG 05 MIN 46 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 30 METERS  
 DATUM: SEA LEVEL

COUNTY: SUWANNEE  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 82 DEG 54 MIN 40 SEC  
 NORTHING: 3330795 EASTING: 315834  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR NORTHERN, EAST COAST, AND HARD ROCK DISTRICTS IN FLORIDA IS 10.507 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 5.46% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 112-78, NTIS: PB286 648/AS, 1978, 199 PP.

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OR ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: MASSIVE; IRREGULAR

CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION: HAWTHORN FORMATION                    GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DECLOONITE	CARBONATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

U. S. GEOLOGICAL SURVEY. LAND USE AND LAND COVER, VALDOSTA. U.S. GEOL. SURVEY OPEN FILE 76-013-7, 1972.

ZELLARS-WILLIAMS INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM. RUMINES OPEN FILE REPORT 112-78, ATIS: FG J86 648/AS, 1978, 199 PP.

GEORGIALOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SAVANNAH DEPOSIT  
 NATION: USA STATE: GEORGIA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 31 DEG 57 MIN 30 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 3 METERS  
 DATUM: SEA LEVEL

SEQUENCE NUMBER: 0130510004

COUNTY: CHATHAM  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 80 DEG 58 MIN 30 SEC  
 NORTHING: 3535629 EASTING: 502362  
 PRECISION: 5 KILOMETERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP; FEDERAL LEASE;  
 STATE LEASE

OWNERSHIP  
 UNIDENTIFIED OWNER  
 STATE & FEDERAL LEASE AREAS

STATUS  
 OWNER  
 OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR GEORGIA, NORTH CAROLINA, AND SOUTH CAROLINA IS 20.971 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 8.79% OF P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF GEORGIA, NORTH CAROLINA, AND SOUTH CAROLINA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 14-79, 1978, 65 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE  
 YEAR OF DISCOVERY: 1965

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION: HAWTHORN FORMATION      GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLomite	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLomite	CARBONATES	VARIABLE

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: STATENVILLE DEPOSIT SEQUENCE NUMBER: 0131010001

NATION: USA STATE: GEORGIA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 30 DEG 43 MIN 00 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 46 METERS  
 DATUM: SEA LEVEL

COUNTY: ECHOLS  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 83 DEG 07 MIN 30 SEC  
 NORTHING: 3399946 EASTING: 296510  
 PRECISION: 1 KILOMETER  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 PRIVATE LEASE; FEE OWNERSHIP;  
 MINERALS ONLY

ALTERNATE NAMES  
 SOUTH GEORGIA

OWNERSHIP	STATUS
VARIOUS PRIVATE OWNERS	UNKNOWN

COMMODITY	MODIFIER	MARKEABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABLITY
ALUMINUM	ALUMINA	AFFECT MARKETABLITY
MAGNESIUM	OXIDE	AFFECT MARKETABLITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR GEORGIA, NORTH CAROLINA, AND SOUTH CAROLINA IS 20.971 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 8.79% OF P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF GEORGIA, NORTH CAROLINA, AND SOUTH CAROLINA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 14-79, 1978, 65 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 ORE-MINERAL IN PLACE  
 YEAR OF DISCOVERY: 1890

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
 MODE OF ORIGIN: SEDIMENTATION  
 SHAPE OF ORE BODY: TABULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION:	HAWTHORN FORMATION	GEOLOGIC AGE:	MIocene
ROCK TYPE:			
PHOSPHORITE	IS ORE		
SAND	GANGUE		
SILT	GANGUE		
CLAY	GANGUE		

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	CRAIN SIZE
QUARTZ	SILICATES	PHANERITIC-FINE
COLLOPHANE	PHOSPHATES	PHANERITIC-FINE
MONTMORILLONITE	SILICATES	PHANERITIC-FINE

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ZELLARS-WILLIAMS INC., EVALUATION OF THE PHOSPHATE DEPOSITS OF FLORIDA USING THE MINERALS AVAILABILITY SYSTEM, BUMINES OPEN FILE REPORT 112-78, NTIS: PB 28E 648/AS, 1978, 199 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

IDaho

DEPOSIT NAME: GAY MINE	SEQUENCE NUMBER: 0160110035
NATION: USA STATE: IDAHO	COUNTY: BINGHAM
TYPE OF OPERATION: SURFACE	CURRENT STATUS: PRODUCER
LATITUDE: N 43 DEG 02 MIN 55 SEC	LONGITUDE: W 112 DEG 07 MIN 15 SEC
UTM - ZONE: 12 HEMISPHERE: NORTHERN	NORTHING: 4766607 EASTING: 408711
POINT OF REFERENCE: ORE BODY	PRECISION: 100 METERS
ELEVATION: 1725 METERS	PRECISION: 10 METERS
DATUM: SEA LEVEL	YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
PRIVATE LEASE

OWNERSHIP	STATUS
BANNOCK-SHOSHONE INDIAN TRIBE	OWNER
J.R. SIMPLOT COMPANY	OWNER-OPERATOR
FOOD MACHINERY AND CHEMICAL CORP. (FMC)	OWNER

COMMODITY	MARKETABILITY
PHOSPHATE	PRIMARY PRODUCT
URANIUM	RECOVERABLE
VANADIUM	RECOVERABLE
FLUORINE	RECOVERABLE
RARE EARTH	RECOVERABLE

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR IDAHO AND MONTANA IS 352 MILLION METRIC TONS OF ORE AT AN IN SITU GRADE OF 25.6% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTEL, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:	-----EXPLORATION METHODS-----
ORE-MINERAL IN PLACE	SURFACE GEOLOGICAL MAPPING/GEOLOGICAL INFERENCE/ DRILLING/TRENCHING/BEDROCK SAMPLING
YEAR OF INITIAL PRODUCTION: 1946	



## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE  
 LATITUDE: N 43 02 55  
 PERCENT SHIPPED: 30  
 METHOD OF TRANSPORTATION: RAIL  
 DESTINATION FACILITY: MILL (OFF-SITE)  
 LATITUDE: N 42 54 00

LOCATION: USA IDAHO  
 LONGITUDE: W 112 07 15  
 DISTANCE (KM): 48  
 LOCATION: USA IDAHO (SIMPLOT)  
 LONGITUDE: W 112 34 00

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE  
 LATITUDE: N 43 02 55  
 PERCENT SHIPPED: 70  
 METHOD OF TRANSPORTATION: RAIL  
 DESTINATION FACILITY: MILL (OFF-SITE)  
 LATITUDE: N 42 54 00

LOCATION: USA IDAHO  
 LONGITUDE: W 112 07 15  
 DISTANCE (KM): 48  
 LOCATION: USA IDAHO (FMC)  
 LONGITUDE: W 112 35 00

## BENEFICIATION:

METHOD: PYROMETALLURGICAL  
 DESIGN CAPACITY: 4000  
 UNITS: MT ORE/DAY

----- DESCRIPTION OF MILLING -----  
 SCREEN/CRUSH/CALCINE/GRIND

## BENEFICIATION:

METHOD: PYROMETALLURGICAL

----- DESCRIPTION OF MILLING -----  
 ORE STOCKPILE/SCREEN/CRUSH/BRIQUETTE FORMATION/  
 INDURATION (CALCINE)

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U.S. GEOLOGICAL SURVEY, BUREAU OF LAND MANAGEMENT, AND FOREST SERVICE. FINAL ENVIRONMENTAL IMPACT STATEMENT/DEVELOPMENT OF PHOSPHATE RESOURCES IN SOUTHEASTERN IDAHO. FOUR VOLUMES, 1978.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: CONDA MINE

SEQUENCE NUMBER: 0160290004

NATION: USA STATE: IDAHO

COUNTY: CARIBOU

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 42 DEG 43 MIN 40 SEC

LONGITUDE: W 111 DEG 31 MIN 36 SEC

UTM - ZONE: 12 HEMISPHERE: NORTHERN

NORTHING: 4730505 EASTING: 456881

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 1920 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEDERAL LEASE; PATENTED CLAIM

## ALTERNATE NAMES

N. TRAIL CANYON  
WOODALL MOUNTAIN

## OWNERSHIP

U. S. GOVT. - BUREAU OF LAND MANAGEMENT

## STATUS

OWNER

J.R. SIMPLOT CO.

OWNER-OPERATOR

U. S. GOVT. - FOREST SERVICE

OWNER

## COMMODITY

## MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

URANIUM

RECOVERABLE

VANADIUM

RECOVERABLE

FLUORINE

RECOVERABLE

RARE EARTH

RECOVERABLE

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3
INDICATED	65,269,000	10,397,000	75,667,000
INFERRRED	73,706,000	34,635,000	108,340,000
UNITS	MT ORE	MT ORE	MT ORE
YEAR/DATA	1975	1975	1975

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	26.5	WT-PCT
2	P205	16.6	WT-PCT
3	P205	25.1	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORD 1: MEDIUM PLUS HIGH GRADE ORE (GARRAND)

RECORD 2: LOW GRADE RESOURCE, LOW GRADE ORE ONLY (GARRAND)

RECORD 3: LOW PLUS MEDIUM PLUS HIGH GRADE ORE (GARRAND)

SOURCE FOR RECORDS 1, 2, AND 3:

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#### DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

ORE-MINERAL IN PLACE

-----EXPLORATION METHODS-----

SURFACE GEOLOGICAL MAPPING/GEOLOGICAL

YEAR OF INITIAL PRODUCTION: 1922

INFERENCE/DRILLING/TEST DRIFT/CROSSCUT/TRENCHING/BEDROCK SAMPLING

#### GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDING; LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

MINERALIZED ZONE:

AVERAGE LENGTH: 2000 METERS

AVERAGE WIDTH: 600 METERS

STRIKE/DIP: N00W/20E

UNCONSOLIDATED MATERIAL:

AVERAGE THICKNESS: 1 METER

LITHOLOGY:

NAME OF FORMATION: PHOSPHORIA (MEADE PEAK) GEOLOGIC AGE: PERMIAN

DEFORMATION DESCRIPTION: MAJOR FAULTING; FOLDING

RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

GEOLOGIC AGE: MESOZOIC

ROCK TYPE:

PHOSPHORITE IS ORE

SHALE ENCLOSES ORE; GANGUE

LIMESTONE LIES UNDER ORE; GANGUE

MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
COLLORPHANE	PHOSPHATES	VARIABLE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
SEHICITE	SILTCLATES	VARIABLE
KACLIVITE	SILCLATES	VARIABLE
MONTMORILLONITE	SILCLATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	VARIABLE
ORTHOCLASIE	SILCLATES	VARIABLE
CHALCEDONY	FORMS OF SiO <sub>2</sub>	VARIABLE
FIRKITE	SULFIDES	VARIABLE

MINE/MILL INFORMATION  
CONDA MINE AND WASH PLANT

**SURFACE MINING:**

METHOD: OPEN-PIT  
 CAPACITY: 4000  
 DESCRIPTION OF COVER:  
 SAND, SILT;  
 MEDIUM-HARD ROCKS  
 PERCENT WASTE ROCK: 86  
 BENCH HEIGHT: 12 METERS

UNITS: MT ORE/DAY  
 HARDNESS OF ORE:  
 MEDIUM-HARD ROCKS

SLOPE OF PIT: 45 DEGREES

**TRANSPORTATION (ORE):**

ORIGINATING FACILITY: MINE  
 LATITUDE: N 42 43 40  
 PERCENT SHIPPED: 100  
 METHOD OF TRANSPORTATION: TRUCK; PIPELINE

LOCATION: U.S.A. IDAHO  
 LONGITUDE: W 111 31 36  
 DISTANCE (KM): 1; 2.3

**BENEFICIATION:**

METHOD: WASHING

----- DESCRIPTION OF MILLING -----  
 SCREEN/CRUSH/SCREEN/GRIND/3-STAGE  
 CYCLONE/FILTER/DRY

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
WASH PRODUCT	P205	80	31	WT-PCT

**TRANSPORTATION FOR PRODUCT: WASH PRODUCT**

ORIGINATING FACILITY: MILL (ON-SITE)  
 LATITUDE: N 42 43 00  
 PERCENT SHIPPED: 60  
 METHOD OF TRANSPORTATION: RAIL  
 DESTINATION FACILITY: MILL (OFF-SITE)  
 LATITUDE: N 42 54 00

LOCATION: CONDA WASH PLANT  
 LONGITUDE: W 111 42 00  
 DISTANCE (KM): 109  
 LOCATION: POCATELLO CALCINER  
 LONGITUDE: W 112 34 00

MINE/MILL INFORMATION  
CONDA PRODUCT TO POCATELLO

**BENEFICIATION:**

METHOD: PYROMETALLURGICAL

----- DESCRIPTION OF MILLING -----  
 CALCINE

PRODUCT	ASSAY FORM	CONCENTRATE GRADE	UNIT
CALCINE	P20E	35	WT-PCT

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: MOUNTAIN FUEL LEASE

SEQUENCE NUMBER: 0160290009

NATION: USA STATE: IDAHO  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 43 DEG 38 MIN 41 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: CREE BODY  
 ELEVATION: 3145 METERS  
 DATUM: SEA LEVEL

COUNTY: CARIBOU  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 111 DEG 17 MIN 23 SEC  
 NORTHING: 4721189 EASTING: 476248  
 PRECISION: 500 METERS  
 PRECISION: 100 METERS  
 YEAR OF INFORMATION: 1979

## TYPE OF MINERAL HOLDING

FEDERAL LEASE

## OWNERSHIP

U. S. GOVT. - FOREST SERVICE  
BECKER INDUSTRIES CORP.

## STATUS

OWNER  
OPERATOR

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
URANIUM	UB308 CONTENT	RECOVERABLE
VANADIUM	PHOSPHATIC SHALE	RECOVERABLE
FLUORITE		RECOVERABLE
RARE EARTH		RECOVERABLE

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3
MEASURED	9,000,000	-----	-----
INDICATED	-----	8,400,000	12,000,000
UNITS	MT ORE	YT ORE	MT ORE
YEAR/DATA	1978	1975	1975

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	F20F	27.6	WT-PCT
	U7CP	0.01	WT-PCT
	V20S	0.07	WT-PCT
	F	2.76	WT-PCT
	RARE EARTH	0.1	WT-PCT
2	F205	19.6	WT-PCT
	U308	0.01	WT-PCT
	V20S	0.07	WT-PCT
	F	1.96	WT-PCT
	RARE EARTH	0.1	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORD 1: STRIPPING RATIO = 3.0 CUBIC YARDS WASTE TO 1 TON ORE.  
 RECORD 2: STRIPPING RATIO = 3.7 CUBIC YARDS OVERBURDEN TO 1 TON ORE/MEDIUM  
           PLUS HIGH GRADE ORE.  
 RECORD 3: STRIPPING RATIO = 1.6 CUBIC YARDS OVERBURDEN TO 1 TON ORE/LOW PLUS  
           MEDIUM PLUS HIGH GRADE ORE.

## SOURCE FOR RECORD 1:

U. S. GEOLOGICAL SURVEY, BUREAU OF LAND MANAGEMENT, AND FOREST  
 SERVICE. FINAL ENVIRONMENTAL IMPACT STATEMENT/DEVELOPMENT OF  
 PHOSPHATE RESOURCES IN SOUTHEASTERN IDAHO. FOUR VOLUMES, 1978.

## SOURCE FOR RECORD 2 AND 3:

GARRAND, L. J. PHOSPHATE STUDY SOUTHEASTERN IDAHO, FOR: U. S.  
 DEPARTMENT OF AGRICULTURE, CARIBOU NATIONAL FOREST. U. S.  
 DEPARTMENT OF AGRICULTURE CONTRACT NO. 50-820; GARRAND  
 CORPORATION, 1975.

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDING; LITHOLOGY

## LITHOLOGY:

NAME OF FORMATION: PHOSPHORIA FORMATION     GEOLOGIC AGE: PERMIAN  
 DEFORMATION DESCRIPTION: MINOR FOLDING; FOLDING  
 RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION  
 GEOLOGIC AGE: MESOZOIC

## ROCK TYPE:

CHERT	LIES OVER ORE
MUDSTONE	ENCLOSES ORE; GANGUE
SHALE	ENCLOSES ORE; GANGUE
PHOSPHORITE	IS ORE
LIMESTONE	ENCLOSES ORE; GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
COLLOPHANE	PHOSPHATES	VARIABLE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
SERICITE	SILICATES	VARIABLE
KAOLINITE	SILICATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
CALCITE	CARBONATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	VARIABLE
ORTHOCLASE	SILICATES	VARIABLE
CHALCEDONY	FORMS OF SiO <sub>2</sub>	VARIABLE
PYRITE	SULFIDES	VARIABLE

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- LI, TA M. SOUTHEASTERN IDAHO PHOSPHATE MINING: HOW AN ENVIRONMENTAL IMPACT STATEMENT DISTORTS GROWTH PLANS. MINING ENGINEERING, V. 30, NO. 1, 1978, PP. 25-28.
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U.S. GEOLOGICAL SURVEY, BUREAU OF LAND MANAGEMENT, AND FOREST SERVICE, FINAL ENVIRONMENTAL IMPACT STATEMENT/ DEVELOPMENT OF PHOSPHATE RESOURCES IN SOUTHEASTERN IDAHO, FOUR VOLUMES, 1978.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: MAYBE CANYON MINE

SEQUENCE NUMBER: 0160290034

COUNTRY: USA STATE: IDAHO  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 42 DEG 45 MIN 33 SEC  
 UTM - ZONE: 12 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 2316 METERS  
 DATUM: SPA LEVEL

COUNTY: CARIBOU  
 CURRENT STATUS: PRODUCER  
 LONGITUDE: W 111 DEG 18 MIN 29 SEC  
 NORTHING: 4733902 EASTING: 474792  
 PRECISION: 500 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEDERAL LEASE

ALTERNATE NAMES  
 MAGIC CANYON  
 S. ERY HIKE

OWNERSHIP  
 U. S. GOVT. - FOREST SERVICE  
 BECKER CORPORATION  
 WESTERN FERTILIZER COOPERATIVE

STATUS  
 OWNER  
 OWNER-OPERATOR  
 OWNER

COMMODITY  
 PHOSPHATE  
 URANIUM  
 VANADIUM  
 FLUORITE  
 RARE EARTH

MARKETABILITY  
 PRIMARY PRODUCT  
 RECOVERABLE  
 RECOVERABLE  
 RECOVERABLE  
 RECOVERABLE

ESTABLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3
INDICATED	23,500,000	2,900,000	73,400,000
INFERRED	40,600,000	16,200,000	56,700,000
UNITS	MT ORE	MT ORE	MT ORE
YEAR/DATA	1975	1975	1975

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	F20E	28	WT-PCT
2	F20S	18	WT-PCT
3	P20S	25	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORD 1: MEDIUM PLUS HIGH GRADE ORE  
 RECORD 2: LOW GRADE RESOURCE, LOW GRADE ORE ONLY  
 RECORD 3: LOW PLUS MEDIUM PLUS HIGH GRADE ORE

## SOURCE FOR RECORD 1, 2, AND 3:

GARRAND, L. J. PHOSPHATE STUDY SOUTHEASTERN IDAHO. FOR: U. S.  
 DEPARTMENT OF AGRICULTURE, CARIBOU NATIONAL FOREST. U. S.  
 DEPARTMENT OF AGRICULTURE CONTRACT NO. 50-820: GARRAND CORP., 1975.

DEPOSIT\_HISTORICAL\_INFORMATION

## DISCOVERY METHOD:

ORE-MINERAL IN PLACE

## -----EXPLORATION METHODS-----

SURFACE GEOLOGICAL MAPPING/GEOLOGICAL  
INFERENCE/DRILLING/TEST DRIFT/CROSSCUT/  
TRENCHING/BEDROCK SAMPLING

## YEAR OF INITIAL PRODUCTION: 1966

GEOLOGIC\_AND\_SPATIAL\_CHARACTERISTICS\_OF\_DEPOSIT

## TYPE OF ORE BODY: SEDIMENTARY

## MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

## SHAPE OF ORE BODY: TABULAR

## CONTROLLING FEATURES: BEDDING; LITHOLOGY

## DEGREE OF WALL ROCK ALTERATION: NONE

## MINERALIZED ZONE:

AVERAGE LENGTH: 8000 METERS

AVERAGE WIDTH: 100 METERS

MINIMUM DEPTH: 0 METERS

STRIKE/DIP: N20W/30E

## UNCONSOLIDATED MATERIAL:

AVERAGE THICKNESS: 1 METER

## LITHOLOGY:

NAME OF FORMATION: PHOSPHORIA (MEADE PEAK) GEOLOGIC AGE: PERMIAN

DEFORMATION DESCRIPTION: MAJOR FAULTING; FOLDING

RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

GEOLOGIC AGE: MESOZOIC

## ROCK TYPE:

PHOSPHORITE

IS ORE

SHALE

ENCLOSES ORE; GANGUE

LIMESTONE

LIES UNDER ORE; GANGUE

## MINERALIZATION:

## MINERAL NAME

## MINERAL CLASS

## GRAIN SIZE

COLLOPHANE

PHOSPHATES

VARIABLE

QUARTZ

FORMS OF SiO<sub>2</sub>

VARIABLE

SERICITE

SILICATES

VARIABLE

KAOLINITE

SILICATES

VARIABLE

MONTMORILLONITE

SILICATES

VARIABLE

DOLOMITE

CARBONATES

VARIABLE

LIMONITE

OXIDES (EXCLUDING SiO<sub>2</sub>)

VARIABLE

ORTHOCLASE

SILICATES

VARIABLE

CHALCEDONY

FORMS OF SiO<sub>2</sub>

VARIABLE

PYRITE

SULFIDES

VARIABLE

MINE/MILL\_INFORMATION

## SURFACE MINING:

METHOD: OPEN-PIT

UNITS: MT ORE/DAY

CAPACITY: 9100

HARDNESS OF ORE:

DESCRIPTION OF COVER:

MEDIUM-HARD ROCKS

SAND, SILT;

MEDIUM-HARD ROCKS

SLOPE OF PIT: 45 DEGREES

PERCENT WASTE ROCK: 75

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE  
 LATITUDE: N 42 45 33  
 PERCENT SHIPPED: 100  
 METHOD OF TRANSPORTATION: RAIL  
 DESTINATION FACILITY: MILL (OFF-SITE)  
 LATITUDE: N 42 44 30

LOCATION: U.S.A. IDAHO  
 LONGITUDE: W 111 18 29

DISTANCE (KM): 26  
 LOCATION: BEKER CONDA PLANT  
 LONGITUDE: W 111 32 32

## BENEFICIATION:

METHOD: PYROMETALLURGICAL  
 DESIGN CAPACITY: 7100  
 UNITS: MT ORE/DAY

-----DESCRIPTION OF MILLING-----  
 CRUSH/SCREEN/GRIND/CYCLONE/  
 DRY COARSE FRACTION/CALCINE

PRODUCT	ASSAY FORM	CONCENTRATE GRADE	UNIT
CALCINE	F205	31	WT-PCT

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MC CIVITT, J. F. ECONOMIC EVALUATION OF PHOSPHATE AND OTHER MINERALS IN SOUTHERN IDAHO. IDAHO BUREAU OF MINES AND GEOLOGY, PAMPHLET NO. 111, 1956, 42 PP.

POWELL, J. D. EVALUATION OF PHOSPHATE RESOURCES IN SOUTHEASTERN IDAHO. IDAHO BUREAU OF MINES AND GEOLOGY, INFORMATION CIRCULAR NO. 25, 1974, 33 PP.

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SERVICE, A. L. AN EVALUATION OF THE WESTERN PHOSPHATE INDUSTRY AND ITS RESOURCES (IN FIVE PARTS), 3. IDAHO. U.S. BUREAU OF MINES, REPORT OF INVESTIGATIONS 6801, 1966, 201 PP.

SERVICE, A. L., AND N. S. PETERSEN. AN EVALUATION OF MATION. U.S. GEOLOGICAL SURVEY BULLETIN 1009-D, PP. 107-122 PARTS) TRENDS AND OUTLOOK: U.S. BUREAU OF MINES, REPORT OF INVESTIGATIONS 6935, 1967, 131 PP.

SERVICE, A. L. AND C. C. POPOFF. AN EVALUATION OF THE WESTERN PHOSPHATE INDUSTRY AND ITS RESOURCES (IN FIVE PARTS), 1. INTRODUCTION REVIEW: U.S. BUREAU OF MINES, REPORT OF INVESTIGATIONS 6485, 1964, 86 PP.

THOMPSON, M. E. DISTRIBUTION OF URANIUM IN RICH PHOSPHATE BEDS OF THE PHOSPHORIA FORMATION. U.S. GEOLOGICAL SURVEY BULLETIN 988-D, 1953, PP. 45-65

THOMPSON, M. E. FURTHER STUDIES OF THE DISTRIBUTION OF URANIUM IN RICH PHOSPHATE BEDS OF THE PHOSPHORIA FORMATION. U.S. GEOLOGICAL SURVEY BULLETIN 1009-D, 1954, PP. 107-122

U.S. GEOLOGICAL SURVEY, BUREAU OF LAND MANAGEMENT, AND FOREST SERVICE. FINAL ENVIRONMENTAL IMPACT STATEMENT/DEVELOPMENT OF PHOSPHATE RESOURCES IN SOUTHEASTERN IDAHO. FOUR VOLUMES, 1978.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: CHAMP LEASE

SEQUENCE NUMBER: 0160290035

NATION: USA STATE: IDAHO  
 TYPE OF OPERATION: MINERAL LOCATION  
 LATITUDE: N 42 DEG 40 MIN 18 SEC  
 LONGITUDE: W 111 DEG 16 MIN 29 SEC  
 UTM - ZONE: 12 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 2073 METERS  
 DATUM: SEA LEVEL

COUNTY: CARIBOU  
 CURRENT STATUS: EXPLORED DEPOSIT  
 NORTHING: 4724177 EASTING: 477488  
 PRECISION: 500 METERS  
 PRECISION: 500 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEDERAL LEASE: MINERALS ONLY

OWNERSHIP:  
 U. S. GOVT. - FOREST SERVICE  
 CEKER INDUSTRIES

STATUS  
 OWNER  
 OPERATOR

COMMODITY	MODIFIER
PHOSPHATE	URANIAN
URANIUM	U3O8 CONTENT
VANADIUM	PHOSPHATIC SHALE
FLUORITE	
RARE EARTH	

MARKETABILITY	PRIMARY PRODUCT
RECOVERABLE	RECOVERABLE
RECOVERABLE	RECOVERABLE
RECOVERABLE	RECOVERABLE

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3	RECORD 4
MEASURED	3,200,000	-----	-----	-----
INVOLVED	-----	564,000	633,000	1,597,000
UNITS	MT ORE	MT ORE	MT ORE	MT ORE
YEAR/DATA	1978	1975	1975	1975

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
2	P205	26.5	WT-PCT
	U308	0.01	WT-PCT
	V205	0.07	WT-PCT
	F	2.65	WT-PCT
	RARE EARTH	0.1	WT-PCT
3	F205	17.6	WT-PCT
	U308	0.01	WT-PCT
	V205	0.07	WT-PCT
	F	1.76	WT-PCT
	RARE EARTH	0.1	WT-PCT
4	P205	23.0	WT-PCT
	U308	0.01	WT-PCT
	V205	0.07	WT-PCT
	F	2.30	WT-PCT
	RARE EARTH	0.1	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORD 1: STRIPPING RATIO = 2.9 CUBIC YARDS OVERBURDEN TO 1 TON OF ORE; NO GRADES PUBLISHED.

RECORD 2: STRIPPING RATIO = 3.6 CUBIC YARDS OVERBURDEN TO 1 TON OF ORE; MEDIUM & PLUS HIGHER GRADE RESOURCE.

RECORD 3: LOW GRADE RESOURCE.

RECORD 4: STRIPPING RATIO = 2.0 CUBIC YARDS OVERBURDEN TO 1 TON OF ORE; LOW PLUS MEDIUM PLUS HIGH GRADE RESOURCES.

## SOURCE FOR RECORD 1:

U. S. GEOLOGICAL SURVEY, BUREAU OF LAND MANAGEMENT, AND FOREST SERVICE. FINAL ENVIRONMENTAL IMPACT STATEMENT/DEVELOPMENT OF PHOSPHATE RESOURCES IN SOUTHEASTERN IDAHO. FOUR VOLUMES, 1978.

## SOURCE FOR RECORD 2, 3, AND 4:

GARRAND, L. J. PHOSPHATE STUDY SOUTHERASTERN IDAHO. FOR: U. S. DEPARTMENT OF AGRICULTURE, CARIBOU NATIONAL FOREST. U. S. DEPARTMENT OF AGRICULTURE CONTRACT NO. 50-820; GARRAND CORPORATION.

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: TABULAR

ORE CONTROLS: FOLDING; FAULTING; BEDDING

## LITHOLOGY:

NAME OF FORMATION: PHOSPHORIA (MEADE PEAK) ~ GEOLOGIC AGE: PERMIAN  
 DEFORMATION DESCRIPTION: MAJOR FAULTING; FOLDING  
 RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION  
 GEOLOGIC AGE: MESOZOIC

## ROCK TYPE:

PHOSPHORITE	IS ORE
SHALE	ENCLOSES ORE; GANGUE
LIMESTONE	LIES UNDER ORE; GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
COLLOPHANE	PHOSPHATES	VARIABLE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
SERICITE	SILICATES	VARIABLE
KAOLINITE	SILICATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
CALCITE	CARBONATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	VARIABLE
ORTHOCLASE	SILICATES	VARIABLE
CHALCEDONY	FORMS OF SiO <sub>2</sub>	VARIABLE
PYRITE	SULFIDES	VARIABLE

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: HENRY MINE

SEQUENCE NUMBER: 0160290055

NATION: USA STATE: IDAHO  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 42 DEG 52 MIN 05 SEC  
 UTM - ZONE: 12 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: CRE BODY  
 ELEVATION: 2011 METERS  
 DATUM: SEA LEVEL

COUNTY: CARIBOU  
 CURRENT STATUS: PRODUCER  
 LONGITUDE: W 111 DEG 27 MIN 40 SEC  
 NORTHING: 4746051 EASTING: 462334  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING:  
 FEDERAL LEASE; STATE LEASE

ALTERNATE NAMES:  
 NORTH ROCKY RANGE

OWNERSHIP	STATUS
U. S. GOVT. - BUREAU OF LAND MANAGEMENT	OWNER
STATE OF IDAHO	OWNER
MONSANTO CORPORATION	OWNER-OPERATOR

COMMODITY	MARKETABILITY
PHOSPHATE	PRIMARY PRODUCT
URANIUM	RECOVERABLE
VANADIUM	RECOVERABLE
FLUORITE	RECOVERABLE
RARE EARTH	RECOVERABLE

PUBLISHED RESERVE-RESOURCE INFORMATION

INDICATED	RECORD 14
UNITS	29,000,000
YEAR/LATA	MT ORE
	1975

IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	F205	28.4	WT-PCT

RESERVE-RESOURCE - REMARKS

RECORD 1: MEDIUM PLUS HIGH GRADE ORE

SOURCE FOR RECORD 1:

GARRAND, L. J. PHOSPHATE STUDY SOUTHEASTERN IDAHO. FOR: U. S.  
 DEPARTMENT OF AGRICULTURE, CARIBOU NATIONAL FOREST. U. S.  
 DEPARTMENT OF AGRICULTURE CONTRACT NO. 50-820; GARRAND CORPORATION.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD: ----- EXPLORATION METHODS -----  
ORE-MINERAL IN PLACE SURFACE GEOLOGICAL MAPPING/GEOLOGICAL  
INFERENCE/DRILLING/TRENCHING/BEDROCK SAMPLING  
YEAR OF INITIAL PRODUCTION: 1969

## GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
SHAPE OF ORE BODY: TABULAR  
CONTROLLING FEATURES: BEDDING; LITHOLOGY  
DEGREE OF WALL ROCK ALTERATION: NONE

UNCONSOLIDATED MATERIAL:  
AVERAGE THICKNESS: 1 METER

LITHOLOGY:  
NAME OF FORMATION: PHOSPHORIA(MEADE PEAK) GEOLOGIC AGE: PERMIAN  
DEFORMATION DESCRIPTION: MAJOR FAULTING; FOLDING  
RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION  
GEOLOGIC AGE: MESOZOIC

ROCK TYPE: PHOSPHORITE IS ORE  
SHALE ENCLOSSES ORE; GANGUE  
LIMESTONE LIES UNDER ORE; GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
COLLOPHANE	PHOSPHATES	VARIABLE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
SERICITE	SILICATES	VARIABLE
KAOLINITE	SILICATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	VARIABLE
ORTHOCLASE	SILICATES	VARIABLE
CHALCEDONY	FORMS OF SiO <sub>2</sub>	VARIABLE
PYRITE	SULFIDES	VARIABLE

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: OPEN-PIT  
 CAPACITY: 2600  
 DESCRIPTION OF COVER:  
 SAND, GRAVEL;  
 MEDIUM-HARD ROCKS  
 SLOPE OF PIT: 40 DEGREES

UNITS: MT ORE/DAY  
 HARDNESS OF ORE:  
 MEDIUM-HARD ROCKS

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE  
 LATITUDE: N 42 52 05  
 PERCENT SHIPPED: 100  
 METHOD OF TRANSPORTATION: TRUCK  
 DESTINATION FACILITY: MILL (OFF-SITE)  
 LATITUDE: N 42 42 00

LOCATION: U.S.A. IDAHO  
 LONGITUDE: W 111 27 40  
 DISTANCE (KM): 26  
 LOCATION: SOOA SPRINGS  
 LONGITUDE: W 111 37 00

## BENEFICIATION:

METHOD: PYROMETALLURGICAL  
 DESIGN CAPACITY: 2600  
 UNITS: MT ORE/DAY

----- DESCRIPTION OF MILLING -----  
 ORE FROM STOCKPILE AT PLANT TO NODULIZING  
 CALCINER/FUSED PRODUCT TO ROLLS/RESCREENED

PRODUCT ASSAY FORM  
 P205 CALCINES P205

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U. S. GEOLOGICAL SURVEY, BUREAU OF LAND MANAGEMENT, AND FOREST SERVICE, 1978, FINAL ENVIRONMENTAL IMPACT STATEMENT/DEVELOPMENT OF PHOSPHATE RESOURCES IN SOUTHEASTERN IDAHO. FOUR VOLUMES.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: WOOLLEY VALLEY MINE

SEQUENCE NUMBER: 0160290060

NATION: USA STATE: IDAHO

COUNTY: CARIBOU

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 42 DEG 44 MIN 52 SEC

LONGITUDE: W 111 DEG 24 MIN 28 SEC

UTM - ZONE: 12 HEMISPHERE: NORTHERN

NORTHING: 4741926 EASTING: 466670

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 2172 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

## TYPE OF MINERAL HOLDING

FEDERAL LEASE; FEE OWNERSHIP

## ALTERNATE NAMES:

LITTLE LONG VALLEY (UNIT #3)

BLACKFOOT NARROWS (UNIT #1)

## OWNERSHIP

## STATUS

U. S. GOVT. - FOREST SERVICE

OWNER

U. S. GOVT. - BUREAU OF LAND MANAGEMENT

OWNER

STAUFFER CHEMICAL COMPANY

OWNER-OPERATOR

## COMMODITY

## MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

URANIUM

RECOVERABLE

VANADIUM

RECOVERABLE

FLUORINE

RECOVERABLE

RARE EARTH

RECOVERABLE

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3
INDICATED	16,000,000	1,000,000	17,000,000
INFERRRED	11,000,000	2,000,000	13,000,000
UNITS	MT ORE	MT ORE	MT ORE
YEAR/DATA	1975	1975	1975

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	F20E	27	WT-PCT
2	F20E	17	WT-PCT
3	F20E	26	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORD 1: MEDIUM PLUS HIGH GRADE ORE

RECORD 2: LOW GRADE RESOURCE, LOW GRADE ORE ONLY

RECORD 3: LOW PLUS MEDIUM PLUS HIGH GRADE ORE

## SOURCE FOR RECORD 1, 2, AND 3:

GARRAND, L. J. PHOSPHATE STUDY SOUTHEASTERN IDAHO. FOR: U. S. DEPARTMENT OF AGRICULTURE, CARIBOU NATIONAL FOREST, U. S. DEPARTMENT OF AGRICULTURE CONTRACT NO. 50-820: GARRAND CORP., 1975.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

ORE-MINERAL IN PLACE

## -----EXPLORATION METHODS-----

SURFACE GEOLOGICAL MAPPING/GEOLOGICAL INFERENCE/  
DRILLING/TRENCHING/BEDROCK SAMPLING

## YEAR OF INITIAL PRODUCTION: 1955

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

## TYPE OF ORE BODY: SEDIMENTARY

## MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

## SHAPE OF ORE BODY: TABULAR

## CONTROLLING FEATURES: BEDDING: LITHOLOGY

## DEGREE OF WALL ROCK ALTERATION: NONE

## MINERALIZED ZONE:

AVERAGE LENGTH: 4000 METERS  
MINIMUM DEPTH: 0 METERSAVERAGE WIDTH: 80 METERS  
STRIKE/DIP: N40W/60E

## UNCONSOLIDATED MATERIAL:

AVERAGE THICKNESS: 1 METER

## LITHOLOGY:

NAME OF FORMATION: PHOSPHORIA (MEADE PEAK) GEOLOGIC AGE: PERMIAN

DEFORMATION DESCRIPTION: MAJOR FAULTING; FOLDING

RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

GEOLOGIC AGE: MESOZOIC

## ROCK TYPE:

PHOSPHORITE	IS ORE
SHALE	ENCLOSES ORE; GANGUE
LIMESTONE	LIES UNDER ORE; GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
COLLOPHANE	PHOSPHATES	VARIABLE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
SERICITE	SILICATES	VARIABLE
KAOLINITE	SILICATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	VARIABLE
ORTHOCLASE	SILICATES	VARIABLE
CHALCEDONY	FORMS OF SiO <sub>2</sub>	VARIABLE
PYRITE	SULFIDES	VARIABLE

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: OPEN-PIT  
 CAPACITY: 2000  
 DESCRIPTION OF COVER:  
 SAND, SILT;  
 MEDIUM-HARD ROCKS  
 SLOPE OF PIT: 45 DEGREES

UNITS: MT ORE/DAY  
 HARDNESS OF ORE:  
 MEDIUM-HARD ROCKS

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE  
 LATITUDE: N 42 49 52  
 METHOD OF TRANSPORTATION: RAIL  
 DESTINATION FACILITY: MILL (OFF-SITE)  
 LATITUDE: N 42 00 00

LOCATION: WOOLEY VALLEY MINE  
 LONGITUDE: W 111 24 28  
 DISTANCE (KM): 160  
 LOCATION: LEEFE WYO.  
 LONGITUDE: W 111 00 00

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE  
 LATITUDE: N 42 49 52  
 METHOD OF TRANSPORTATION: RAIL  
 DESTINATION FACILITY: MILL (OFF-SITE)  
 LATITUDE: N 46 00 00

LOCATION: WOOLEY VALLEY MINE  
 LONGITUDE: W 111 24 28  
 DISTANCE (KM): 560  
 LOCATION: SILVER BOW MONT.  
 LONGITUDE: W 112 30 00

## BENEFICIATION:

METHOD: WASHING

----- DESCRIPTION OF MILLING -----  
 ORE TO SCREENS/OVERSIZE TO HAMRMILL/  
 UNDER TO 10M SCREENS/10M OVER TO ROD MILL/  
 ROD&10M UNDERSIZE TO CYCLONE/CYCLONE/  
 UNDERSIZE TO CALCINE

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: RASMUSSEN RIDGE MINE SITE      SEQUENCE NUMBER: 0160290062  
 (STAUFFER)

NATION: USA      STATE: IDAHO  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 42 DEG 52 MIN 14 SEC  
 UTM - ZONE: 12 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 2075 METERS  
 DATUM: SEA LEVEL

COUNTY: CARIBOU  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 111 DEG 22 MIN 50 SEC  
 NORTHING: 4746295 EASTING: 468915  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEDERAL LEASE; PATENTED CLAIM

OWNERSHIP  
 U.S. GOVT. - FOREST SERVICE  
 STAUFFER CHEMICAL COMPANY

STATUS  
 OWNER  
 OWNER-OPERATOR

COMMODITY  
 PHOSPHATE  
 URANIUM  
 VANADIUM  
 FLUORINE  
 RARE EARTH

MARKETABILITY  
 PRIMARY PRODUCT  
 RECOVERABLE  
 RECOVERABLE  
 RECOVERABLE  
 RECOVERABLE

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3	RECORD 4
MEASURED	14,510,000	-----	-----	-----
INDICATED	-----	18,305,000	2,009,000	20,314,000
UNITS	MT ORE	MT ORE	MT ORE	MT ORE
YEAR/DATA	1978	1975	1975	1975

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	27	WT-PCT
2	P20F	27.3	WT-PCT
3	P205	17.2	WT-PCT
4	P205	26.2	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORD 1: STRIPPING RATIO = 3.4 METRIC TONS WASTE TO 1 METRIC TON ORE.  
 RECORD 2: STRIPPING RATIO = 3.88 CUBIC YARDS WASTE TO 1 METRIC TON ORE (MEDIUM  
 PLUS HIGH GRADE).  
 RECORD 3: LOW GRADE RESOURCE, LOW GRADE ORE ONLY.  
 RECORD 4: STRIPPING RATIO = 3.4 CUBIC YARDS WASTE TO 1 METRIC TON ORE (LOW  
 PLUS MEDIUM PLUS HIGH GRADE).

## SOURCE FOR RECORD 1:

U.S. GEOLOGICAL SURVEY, BUREAU OF LAND MANAGEMENT, AND FOREST SERVICE. FINAL ENVIRONMENTAL IMPACT STATEMENT/DEVELOPMENT OF PHOSPHATE RESOURCES IN SOUTHEASTERN IDAHO. FOUR VOLUMES, 1978.

## SOURCE FOR RECORDS 2, 3, AND 4:

GARRAND, L. J. PHOSPHATE SURVEY SOUTHEASTERN IDAHO. FOR: U.S. DEPARTMENT OF AGRICULTURE, CARIBOU NATIONAL FOREST. U.S. DEPARTMENT OF AGRICULTURE CONTRACT NO. 50-820, GARRAND CORP., 1975.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

ORE-MINERAL IN PLACE

EXPLORATION METHODSSURFACE GEOLOGIC MAPPING/AERIAL PHOTOGRAPHY/  
TRENCHING/BEDROCK SAMPLINGGEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDING; LITHOLOGY

## MINERALIZED ZONE:

STRIKE DIP: N30W/40E

## LITHOLOGY:

NAME OF FORMATION: PHOSPHORIA (MEADE PFAK) GEOLOGIC AGE: PERMIAN

DEFORMATION DESCRIPTION: MINOR FOLDING; FOLDING

RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

GEOLOGIC AGE: MESOZOIC

## ROCK TYPE:

PHOSPHORITE	IS ORE
MUDSTONE	ENCLOSES ORE; GANGUE
LIMESTONE	LIES UNDER ORE; GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
COLLOPHANE	PHOSPHATES	VARIABLE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
SERICITE	SILICATES	VARIABLE
KACLINITE	SILICATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
CALCITE	CARBONATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	VARIABLE
ORTHOCLASE	SILICATES	VARIABLE
CHALCEDONY	FORMS OF SiO <sub>2</sub>	VARIABLE
PYRITE	SULFIDES	VARIABLE

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SMOKY CANYON LEASE

SEQUENCE NUMBER: 0160290079

NATION: USA STATE: IDAHO  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 42 DEG 42 MIN 30 SEC  
 UTM - ZONE: 12 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 2070 METERS  
 DATUM: SEA LEVEL

COUNTY: CARIBOU  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 111 DEG 07 MIN 47 SEC  
 NORTHING: 4728219 EASTING: 489376  
 PRECISION: 500 METERS  
 PRECISION: 100 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING:  
FEDERAL LEASEALTERNATE NAMES  
AREA A, CROW CREEK NE  
AREA C, 35 THRU 48E, STEWART FLATOWNERSHIP  
U.S. GOVT. - FOREST SERVICE  
J.R. SIMPLOT CO.STATUS  
OWNER  
OWNER-OPERATOR

COMMODITY	MODIFIER
PHOSPHATE	U308 CONTENT
URANIUM	PHOSPHATIC SHALE
VANADIUM	
FLUORINE	
RARE EARTH	

MARKETABILITY
PRIMARY PRODUCT
RECOVERABLE
RECOVERABLE
RECOVERABLE
RECOVERABLE

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3
MEASURED	54,000,000	-----	-----
INDICATED	-----	-----	57,000,000
UNDIFFERENTIATED	-----	54,000,000	-----
UNITS	MT ORE	MT ORE	MT ORE
YEAR/DATA	1980	1980	1975
	RECORD 4	RECORD 5	RECORD 6
INDICATED	37,000,000	95,000,000	76,000,000
UNITS	MT ORE	MT ORE	MT ORE
YEAR/DATA	1975	1975	1975
	RECORD 7	RECORD 8	
UNDIFFERENTIATED	48,000,000	125,000,000	
UNITS	MT ORE	MT ORE	
YEAR/DATA	1975	1975	

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
3	P205	27.6	WT-PCT
	U308	0.01	WT-PCT
	V205	0.07	WT-PCT
	F	2.76	WT-PCT
	RARE EARTH	0.1	WT-PCT
4	P205	15.5	WT-PCT
	U308	0.01	WT-PCT
	V205	0.07	WT-PCT
	F	1.55	WT-PCT
	RARE EARTH	0.1	WT-PCT
5	P205	22.9	WT-PCT
	U308	0.01	WT-PCT
	V205	0.07	WT-PCT
	F	2.29	WT-PCT
	RARE EARTH	0.1	WT-PCT
6	P205	27.6	WT-PCT
	U308	0.01	WT-PCT
	V205	0.07	WT-PCT
	F	2.76	WT-PCT
	RARE EARTH	0.1	WT-PCT
7	P205	15.5	WT-PCT
	U308	0.01	WT-PCT
	V205	0.07	WT-PCT
	F	1.55	WT-PCT
	RARE EARTH	0.1	WT-PCT
8	P205	22.9	WT-PCT
	U308	0.01	WT-PCT
	V205	0.07	WT-PCT
	F	2.29	WT-PCT
	RARE EARTH	0.1	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORD 1: STRIPPING RATIO = 3 CUBIC YARDS WASTE TO 1 TON OF ORE; NO ASSAY GIVEN.

RECORD 2: NO STRIPPING RATIO AND NO ASSAY GIVEN.

RECORD 3: STRIPPING RATIO = 2.8 YARDS WASTE TO 1 TON ORE (MEDIUM PLUS HIGHER GRADES).

RECORD 4: LOW GRADE - DISCARDED WHEN CALCULATING RESOURCE IN R-REC-3.

RECORD 5: STRIPPING RATIO = 1.6 CUBIC YARDS WASTE TO 1 TON ORE (LOW PLUS MEDIUM PLUS HIGHER GRADE).

RECORD 6: STRIPPING RATIO = 3.8 CUBIC YARDS WASTE TO 1 TON ORE (MEDIUM PLUS HIGHER GRADES).

RECORD 7: LOW GRADE - DISCARDED WHEN CALCULATING RESOURCE IN R-REC-6.

RECORD 8: STRIPPING RATIO = 2.1 CUBIC YARDS WASTE TO 1 TON ORE (LOW PLUS MEDIUM PLUS HIGHER GRADE).

## SOURCE FOR RECORD 1:

U.S. FOREST SERVICE, U.S. GEOLOGICAL SURVEY, AND THE J. R. SIMPLOT COMPANY. ENVIRONMENTAL IMPACT STATEMENT FACT SHEET - SCOPE OF WORK, SMOKY CANYON MINE, IDAHO. MINE PLAN, 1980.

## SOURCE FOR RECORD 2:

JOB SERVICE. POCATELLA EMPLOYMENT, VOL. 14, NO. 5, 1980, PP. 2.

## SOURCE FOR RECORDS 3, 4, 5, 6, 7, AND 8:

GARRAND, L. J. PHOSPHATE STUDY SOUTHEASTERN IDAHO. FOR: U.S. DEPARTMENT OF AGRICULTURE, CARBON NATIONAL FOREST. U.S. DEPARTMENT OF AGRICULTURE CONTRACT NO. 50-820, GARRAND CORP., 1975.

DEPOSIT\_HISTORICAL\_INFORMATION

## DISCOVERY METHOD:

ORE-MINERAL IN PLACE

## -----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE/SURFACE GEOLOGIC MAPPING/TRENCHING/BEDROCK SAMPLING

GEOLOGIC\_AND\_SPATIAL\_CHARACTERISTICS\_OF\_DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDING; LITHOLOGY

## LITHOLOGY:

NAME OF FORMATION: PHOSPHORIA FORMATION GEOLOGIC AGE: PERMIAN

DEFORMATION DESCRIPTION: MINOR FOLDING; FOLDING

RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

GEOLOGIC AGE: MESOZOIC

## ROCK TYPE:

CHERT	LIES OVER ORE
MUDSTONE	ENCLOSES ORE; GANGUE
SHALE	ENCLOSES ORE; GANGUE
PHOSPHORITE	IS ORE
LIMESTONE	ENCLOSES ORE; GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
COLLUPHANT	PHOSPHATES	VARIABLE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
SERICITE	SILICATES	VARIABLE
MADLOVITE	SILICATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
CALCITE	CARBONATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	VARIABLE
OPHOCLASE	SILICATES	VARIABLE
CHALCEOLONY	FORMS OF SiO <sub>2</sub>	VARIABLE
PYRITE	SULFIDES	VARIABLE

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1, U.S. GEOLOGICAL SURVEY TRACE ELEMENTS INVESTIGATIONS REPORT 364, 1953,  
PP. 10-15.

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CANYON MINE, IDAHO MINE PLAN, 1980.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: TRAIL CREEK LEASE

SEQUENCE NUMBER: 0160290160

NATION: USA STATE: IDAHO

COUNTY: CARIBOU

TYPE OF OPERATION: SURFACE

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 42 DEG 44 MIN 11 SEC

LONGITUDE: W 111 DEG 25 MIN 15 SEC

UTM - ZONE: 12 HEMISPHERE: NORTHERN

NORTHING: 4731412 EASTING: 465551

ELEVATION: 2073 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

## TYPE OF MINERAL HOLDING

FEDERAL LEASE; STATE LEASE;

PATENTED CLAIM

## OWNERSHIP

U. S. GOVT. - BUREAU OF LAND MANAGEMENT  
 STATE OF IDAHO  
 MONSANTO CO.  
 U. S. GOVT. - FOREST SERVICE

## STATUS

OWNER  
 OWNER  
 OWNER-OPERATOR  
 OWNER

## COMMODITY

## MODIFIER

## MARKETABILITY

PHOSPHATE  
 URANIUM  
 VANADIUM  
 FLUORINE  
 RARE EARTH

U308 CONTENT  
 PHOSPHATIC SHALE

PRIMARY PRODUCT  
 RECOVERABLE  
 RECOVERABLE  
 RECOVERABLE  
 RECOVERABLE

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3	RECORD 4
MEASURED	27,000,000	-----	-----	-----
INDICATED	-----	42,000,000	12,000,000	54,000,000
UNITS	MT ORE	MT ORE	MT ORE	MT ORE
YEAR/DATA	1978	1975	1975	1975

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
2	P205	24.7	WT-PCT
	U308	0.01	WT-PCT
	V205	0.07	WT-PCT
	F	2.47	WT-PCT
	RARE EARTH	0.1	WT-PCT
3	P205	19.3	WT-PCT

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
3	U3C8	0.01	WT-PCT
	V205	0.07	WT-PCT
	F	1.93	WT-PCT
	RARE EARTH	0.1	WT-PCT
4	P205	23.5	WT-PCT
	U3C8	0.01	WT-PCT
	V205	0.07	WT-PCT
	F	2.35	WT-PCT
	RARE EARTH	0.1	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORD 1: STRIPPING RATIO = 3.0 CUBIC YARDS WASTE TO 1 TON ORE.

RECORD 2: STRIPPING RATIO = 3.3 CUBIC YARDS OVERBURDEN TO 1 TON ORE; MEDIUM PLUS HIGH GRADE ORE.

RECORD 3: LOW GRADE RESOURCE.

RECORD 4: STRIPPING RATIO = 1.6 CUBIC YARDS OVERBURDEN TO 1 TON ORE; LOW PLUS MEDIUM + HIGH GRADE ORE.

## SOURCE FOR RECORD 1:

U. S. GEOLOGICAL SURVEY, BUREAU OF LAND MANAGEMENT, AND FOREST SERVICE. FINAL ENVIRONMENTAL IMPACT STATEMENT/DEVELOPMENT OF PHOSPHATE RESOURCES IN SOUTHEASTERN IDAHO. FOUR VOLUMES, 1978.

## SOURCE FOR RECORD 2, 3, AND 4:

GARRAND, L. J. PHOSPHATE STUDY SOUTHEASTERN IDAHO. FOR: U.S. DEPARTMENT OF AGRICULTURE, CARIBOU NATIONAL FOREST. U. S. DEPARTMENT OF AGRICULTURE CONTRACT NO. 50-820; GARRAND CORPORATION, 1975.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

CRE-MINERAL IN PLACE

## -----EXPLORATION METHODS-----

SURFACE GEOLGIC MAPPING/  
DRILLING/TRENCHING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDING; LITHOLOGY

## LITHOLOGY:

NAME OF FORMATION: PHOSPHORIA FORMATION GEOLOGIC AGE: PERMIAN  
 DEFORMATION DESCRIPTION: MINOR FOLDING; FOLDING  
 RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION  
 GEOLOGIC AGE: MESOZOIC

## ROCK TYPE:

CHERT	LIES OVER ORE
MUDSTONE	ENCLOSES ORE; GANGUE
SHALE	ENCLOSES ORE; GANGUE
PHOSPHORITE	IS ORE
LIMESTONE	ENCLOSES ORE; GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
COLLOPHANE	PHOSPHATES	VARIABLE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
SERICITE	SILICATES	VARIABLE
KAOLINITE	SILICATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
CALCITE	CARBONATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	VARIABLE
ORTHOCLASE	SILICATES	VARIABLE
CHALCEDONY	FORMS OF SiO <sub>2</sub>	VARIABLE
FYRITE	SULFIDES	VARIABLE

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THOMPSON, M. E. FURTHER STUDIES OF THE DISTRIBUTION OF URANIUM IN RICH PHOSPHATE BEDS OF THE PHOSPHORIA FORMATION. U.S. GEOLOGICAL SURVEY BULLETIN 1009-D, 1954, PP. 107-122.

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: NORTH HENRY MINE                   SEQUENCE NUMBER: 0160290161

NATION: USA           STATE: IDAHO                   COUNTY: CARIBOU  
 TYPE OF OPERATION: SURFACE                   CURRENT STATUS: PRODUCER  
 LATITUDE: N 42 DEG 54 MIN 18 SEC           LONGITUDE: W 111 DEG 30 MIN 24 SEC  
 UTM - ZONE: 12           HEMISPHERE: NORTHERN  
 458637   NORTHING: 4750174 EASTING:  
 POINT OF REFERENCE: ORE BODY                   PRECISION: 100 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEDERAL LEASE; STATE LEASE;  
 PATENTED CLAIM

OWNERSHIP  
 U. S. GOVT. - BUREAU OF LAND MANAGEMENT  
 STATE OF IDAHO  
 MONSANTO COMPANY

STATUS  
 OWNER  
 OWNER  
 OWNER-OPERATOR

COMMODITY  
 PHOSPHATE  
 URANIUM  
 VANADIUM  
 FLUORINE  
 RARE EARTH

MARKETABILITY  
 PRIMARY PRODUCT  
 RECOVERABLE  
 RECOVERABLE  
 RECOVERABLE  
 RECOVERABLE

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3
INDICATED	7,600,000	3,300,000	10,900,000
UNITS	MT ORE	MT ORE	MT ORE
YEAR/DATA	1975	1975	1975

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	28.1	WT-PCT
2	P205	17	WT-PCT
3	P205	27.4	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORD 1: MEDIUM PLUS HIGH GRADE ORE  
 RECORD 2: LOW GRADE RESOURCE, LOW GRADE ORE ONLY  
 RECORD 3: LOW PLUS MEDIUM PLUS HIGH GRADE ORE

## SOURCE FOR RECORD 1, 2, AND 3:

GARRAND, L. J. PHOSPHATE STUDY SOUTHEASTERN IDAHO. FOR: U. S.  
 DEPARTMENT OF AGRICULTURE, CARIBOU NATIONAL FOREST. U. S. DEPARTMENT  
 OF AGRICULTURE CONTRACT NO. 50-820; GARRAND CORPORATION.

DEPOSIT\_HISTORICAL\_INFORMATION

DISCOVERY METHOD:  
ORE-MINERAL IN PLACE

-----EXPLORATION METHODS-----  
SURFACE GEOLOGICAL MAPPING/GEOLOGICAL  
INFERENCE/DRILLING/TRENCHING/  
BEDROCK SAMPLING

GEOLOGIC\_AND\_SEATL\_CHARACTERISTICS\_OF\_DEPOSII

TYPE OF ORE BODY: SEDIMENTARY  
MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
SHAPE OF ORE BODY: TABULAR  
CONTROLLING FEATURES: BEDDING; LITHOLCGY  
DEGREE OF WALL ROCK ALTERATION: NONE

MINERALIZED ZONE:  
AVERAGE LENGTH: 2400 METERS  
MINIMUM DEPTH: 0 METERS

AVERAGE WIDTH: 80 METERS  
STRIKE/DIP: N40W/60E

UNCONSOLIDATED MATERIAL:  
AVERAGE THICKNESS: 1 METER

## LITHOLCGY:

NAME OF FORMATION: PHOSPHORIA (MEADE PEAK) GEOLOGIC AGE: PERMIAN  
DEFORMATION DESCRIPTION: MAJOR FAULTING; FOLDING  
RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION  
GEOLOGIC AGE: MESOZOIC

## ROCK TYPE:

PHOSPHORITE	IS ORE
SHALE	ENCLOSES ORE; GANGUE
LIMESTONE	LIES UNDER ORE; GANGUE

## MINERALIZATION:

MINERAL NAME	MINFRAL CLASS	GRAIN SIZE
COLLOPHANE	PHOSPHATES	VARIABLE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
SERICITE	SILICATES	VARIABLE
KAOLINITE	SILICATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE
LIMONITE	OXYIDES (EXCLUDING SiO <sub>2</sub> )	VARIABLE
ORTHOCLASE	SILICATES	VARIABLE
CHALCEDONY	FORMS OF SiO <sub>2</sub>	VARIABLE
FYRITE	SULFIDES	VARIABLE

MINE/MILL\_INFORMATION

## HENRY MINE/SODA SPRGS CALCINER

## SURFACE MINING:

METHOD: OPEN-PIT  
CAPACITY: 2600  
DESCRIPTION OF COVER:  
SAND, GRAVEL;  
MEDIUM-HARD ROCKS

UNITS: MT ORE/DAY  
HARDNESS OF ORE:  
MEDIUM-HARD ROCKS  
SLOPE OF PIT: 40 DEGREES

## BENEFICIATION:

METHOD: PYROMETALLURGICAL  
 DESIGN CAPACITY: 2600  
 UNITS: MT ORE/DAY

----- DESCRIPTION OF MILLING -----  
 ORE FROM STOCKPILE TO SCREEN/PLUS MATERIAL  
 DISCARDED/MINUS MATERIAL TO CALCINE/  
 CALCINE PRODUCT CRUSHED/SIZED

PRODUCT ASSAY FORM  
 P205 CALCINE P205

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: CALDWELL CANYON SITE

SEQUENCE NUMBER: 0160290162

NATION: USA STATE: IDAHO

COUNTY: CARIBOU

TYPE OF OPERATION: SURFACE

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 42 DEG 44 MIN 12 SEC

LONGITUDE: W 111 DEG 22 MIN 00 SEC

UTM - ZONE: 12 HEMISPHERE: NORTHERN

NORTHING: 4731423 EASTING: 469985

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 1926 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING

FEDERAL LEASE; STATE LEASE;

PATENTED CLAIM

## OWNERSHIP

U. S. GOVT. - FOREST SERVICE

OWNER

## STATUS

U. S. GOVT. - BUREAU OF LAND MANAGEMENT

OWNER

STATE OF IDAHO

OWNER

MONSANTO COMPANY

OWNER-OPERATOR

## COMMODITY

## MODIFIER

## MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

URANIUM

RECOVERABLE

VANADIUM

RECOVERABLE

FLUORINE

RECOVERABLE

RARE EARTH

RECOVERABLE

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3	RECORD 4
MEASURED	11,000,000	-----	-----	-----
INDICATED	-----	15,000,000	9,000,000	24,000,000
UNITS	MT ORE	MT ORE	MT ORE	MT ORE
YEAR/DATA	1978	1975	1975	1975

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
2	P205	25.5	WT-PCT
	U308	0.01	WT-PCT
	V205	0.07	WT-PCT
	F	2.6	WT-PCT
	RARE EARTH	0.1	WT-PCT

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
3	F205	19.0	WT-PCT
	U3C8	0.01	WT-PCT
	V205	0.07	WT-PCT
	F	1.9	WT-PCT
	RARE EARTH	0.1	WT-PCT
4	F205	23.1	WT-PCT
	U308	0.01	WT-PCT
	V205	0.07	WT-PCT
	F	2.3	WT-PCT
	RARE EARTH	0.1	WT-PCT

## RESERVE-RESOURCE - REMARKS

- RECORD 1: STRIPPING RATIO = 3.1 CUBIC YARDS OVERBURDEN TO 1 TON ORE.  
 RECORD 2: STRIPPING RATIO = 3.4 CUBIC YARDS OVERBURDEN TO 1 TON ORE; MEDIUM PLUS HIGH GRADE ORE.  
 RECORD 3: LOW GRADE RESOURCE.  
 RECORD 4: STRIPPING RATIO = 2.0 CUBIC YARDS OVERBURDEN TO 1 TON ORE; LOW PLUS MEDIUM PLUS HIGH GRADE ORE.

## SOURCE FOR RECORD 1:

U. S. GEOLOGICAL SURVEY, BUREAU OF LAND MANAGEMENT, AND FOREST SERVICE. FINAL ENVIRONMENTAL IMPACT STATEMENT/DEVELOPMENT OF PHOSPHATE RESOURCES IN SOUTHEASTERN IDAHO. FOUR VOLUMES, 1978.

## SOURCE FOR RECORDS 2, 3, AND 4:

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DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

ORE-MINERAL IN PLACE

-----EXPLORATION METHODS-----  
 SURFACE GEOLOGIC MAPPING/TRENCHING/DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSITS

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDING; LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

## LITHOLOGY:

NAME OF FORMATION: PHOSPHORIA FORMATION GEOLOGIC AGE: PERMIAN  
 DEFORMATION DESCRIPTION: MINOR FOLDING; FOLDING  
 RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION  
 GEOLOGIC AGE: MESOZOIC

## ROCK TYPE:

CHERT	LIES OVER ORE
MUDSTONE	ENCLOSES ORE; GANGUE
SHALE	ENCLOSES ORE; GANGUE
PHOSPHORITE	IS ORE
LIMESTONE	ENCLOSES ORE; GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
COLLOPHANE	PHOSPHATES	VARIABLE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
SERICITE	SILICATES	VARIABLE
KAOLINITE	SILICATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
CALCITE	CARBONATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	VARIABLE
CRYPTOCLASE	SILICATES	VARIABLE
CHALCEDONY	FORMS OF SiO <sub>2</sub>	VARIABLE
PYRITE	SULFIDES	VARIABLE

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: DIAMOND CREEK MINE SITE(ALUMET) SEQUENCE NUMBER: 0160290163

NATION: USA STATE: IDAHO  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 42 DEG 47 MIN 17 SEC  
 UTM - ZONE: 12 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 2020 METERS  
 DATUM: SEA LEVEL

COUNTY: CARIBOU  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 111 DEG 15 MIN 12 SEC  
 NORTHING: 4737095 LASTING: 479279  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEDERAL LEASE; PATENTED CLAIM

OWNERSHIP  
 U. S. GOVT. - FOREST SERVICE  
 ALUMET CORPORATION

STATUS  
 OWNER  
 OWNER-OPERATOR

COMMODITY  
 PHOSPHATE  
 URANIUM  
 VANADIUM  
 FLUORINE  
 RARE EARTH

MARKETABILITY  
 PRIMARY PRODUCT  
 RECOVERABLE  
 RECOVERABLE  
 RECOVERABLE  
 RECOVERABLE

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3	RECORD 4
MEASURED	54,430,000	-----	-----	-----
INDICATED	-----	2,127,000	259,000	2,386,000
UNITS	MT ORE	MT ORE	MT ORE	MT ORE
YEAR/DATA	1978	1975	1975	1975

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
2	P205	27.2	WT-PCT
3	P205	17.2	WT-PCT
4	P205	26.1	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORD 1: STRIPPING RATIO = 8.3 MT WASTE TO 1 MT ORE; NO ASSAY DATA.  
 RECORD 2: STRIPPING RATIO = 3.3 CUBIC YARDS WASTE TO 1 MT ORE (MEDIUM PLUS HIGH GRADE).  
 RECORD 3: LOW GRADE RESOURCE, LOW GRADE ORE ONLY.  
 RECORD 4: STRIPPING RATIO = 2.9 CUBIC YARDS WASTE TO 1 MT ORE (LOW PLUS MEDIUM PLUS HIGH GRADE).

## SOURCE FOR RECORD 1:

U.S. GEOLOGICAL SURVEY, BUREAU OF LAND MANAGEMENT, AND FOREST SERVICE. FINAL ENVIRONMENTAL IMPACT STATEMENT/DEVELOPMENT OF PHOSPHATE RESOURCES IN SOUTHEASTERN IDAHO. FOUR VOLUMES, 1978.

## SOURCE FOR RECORDS 2, 3, AND 4:

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DEPOSIT\_HISTORICAL\_INFORMATION

## DISCOVERY METHOD:

ORE-MINERAL IN PLACE

-----EXPLORATION METHODS-----  
 SURFACE GEOLOGIC MAPPING/AERIAL PHOTOGRAPHY/  
 DRILLING/TRENCHING/BEDROCK SAMPLING

GEOLOGIC\_AND\_SPATIAL\_CHARACTERISTICS\_OF\_DEPOSITS

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDING; LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

## LITHOLOGY:

NAME OF FORMATION: PHOSPHORIA (MEADE PEAK) GEOLOGIC AGE: PERMIAN

DEFORMATION DESCRIPTION: MINOR FOLDING; FOLDING

RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

GEOLOGIC AGE: MESOZOIC

## ROCK TYPE:

PHOSPHORITE IS ORE

MUDSTONE ENCLOSES ORE; GANGUE

LIMESTONE LIES UNDER ORE; GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
COLLOPHANE	PHOSPHATES	AFHANERITIC-MEDIUM
GLAUCITE	FORMS OF SiO <sub>2</sub>	AFHANITIC
SERICITE	SILICATES	AFHANITIC
MACLINITE	SILICATES	AFHANITIC
MONTMORILLONITE	SILICATES	AFHANITIC
CALCITE	CARBONATES	AFHANITIC
DOLOMITE	CARBONATES	AFHANITIC
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	AFHANITIC
CATHOCLAASE	SILICATES	AFHANITIC
CHALCEDONY	FORMS OF SiO <sub>2</sub>	AFHANITIC
PYRITE	SULFIDES	AFHANITIC

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: DRY VALLEY MINE SITE (FMC) SEQUENCE NUMBER: 0160290165

NATION: USA STATE: IDAHO  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 42 DEG 44 MIN 04 SEC  
 UTM - ZONE: 12 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 2000 METERS  
 DATUM: SEA LEVEL

COUNTY: CARIBOU  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 111 DEG 20 MIN 16 SEC  
 NORTHING: 4731166 EASTING: 472349  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEDERAL LEASE; PATENTED CLAIM  
 STATE LEASE

OWNERSHIP  
 U. S. GOVT. - FOREST SERVICE  
 FMC CORPORATION  
 U. S. GOVT. - BUREAU OF LAND MANAGEMENT  
 STATE OF IDAHO

STATUS  
 OWNER  
 OWNER-OPERATOR  
 OWNER  
 OWNER

COMMODITY  
 PHOSPHATE  
 URANIUM  
 VANADIUM  
 FLUORINE  
 RARE EARTH

MARKETABILITY  
 PRIMARY PRODUCT  
 RECOVERABLE  
 RECOVERABLE  
 RECOVERABLE  
 RECOVERABLE

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3	RECORD 4
MEASURED	39,920,000	-----	-----	-----
INDICATED	-----	7,342,000	3,994,000	11,336,000
UNITS	MT ORE	MT ORE	MT ORE	MT ORE
YEAR/DATA	1978	1975	1975	1975

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
2	P205	28.8	WT-PCT
3	P205	16.8	WT-PCT
4	P205	24.6	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORD 1: STRIPPING RATIO = 3.3 METRIC TONS WASTE TO 1 METRIC TON ORE; NO ASSAY DATA  
 RECORD 2: STRIPPING RATIO = 3.85 CUBIC YARDS WASTE TO 1 METRIC TON ORE (MEDIUM PLUS HIGH GRADE).  
 RECORD 3: LOW GRADE RESOURCE, LOW GRADE ORE ONLY.  
 RECORD 4: STRIPPING RATIO = 2.23 CUBIC YARDS WASTE TO 1 METRIC TON ORE (LOW PLUS MEDIUM PLUS HIGH GRADE).

## SOURCE FOR RECORD 1:

U.S. GEOLOGICAL SURVEY, BUREAU OF LAND MANAGEMENT, AND FOREST SERVICE. FINAL ENVIRONMENTAL IMPACT STATEMENT/DEVELOPMENT OF PHOSPHATE RESOURCES IN SOUTHEASTERN IDAHO. FOUR VOLUMES, 1978.

## SOURCE FOR RECORDS 2, 3, AND 4:

GARRAND, L. J. PHOSPHATE SURVEY SOUTHEASTERN IDAHO. FOR: U.S. DEPARTMENT OF AGRICULTURE, CARIBOU NATIONAL FOREST. U.S. DEPARTMENT OF AGRICULTURE CONTRACT NO. 50-820, GARRAND CORP., 1975.

DEPOSIT\_HISTORICAL INFORMATION

## DISCOVERY METHOD:

ORE-MINERAL IN PLACE

-----EXPLORATION METHODS-----  
 SURFACE GEOLOGIC MAPPING/AERIAL PHOTOGRAPHY/  
 DRILLING/TRENCHING/BEDROCK SAMPLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

## GEOMETRY:

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDING; LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

## LITHOLOGY:

NAME OF FORMATION: PHOSPHORIA (MEADE PEAK) GEOLOGIC AGE: PERMIAN

DEFORMATION DESCRIPTION: MINOR FOLDING; FOLDING

RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

GEOLOGIC AGE: MESOZOIC

## ROCK TYPE:

PHOSPHORITE IS ORE

MUDSTONE ENCLOSSES ORE; GANGUE

LIMESTONE LIES UNDER ORE; GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
COLLOPHANE	PHOSPHATES	VARIABLE
QUARTZ	FORMS OF $SiO_2$	VARIABLE
SERICITE	SILICATES	VARIABLE
KAULINITE	SILICATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
CALCITE	CARBONATES	VARIABLE
DECIMONITE	CARBONATES	VARIABLE
LIMONITE	OXIDES (EXCLUDING $SiO_2$ )	VARIABLE
ORTHOCLASE	SILICATES	VARIABLE
CHALCOGENY	FORMS OF $SiO_2$	VARIABLE
PYRITE	SULFIDES	VARIABLE

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EMIGH, G. D. PETROGRAPHY, MINERALOGY AND ORIGIN OF PHOSPHATE PELLETS IN THE PHOSPHORIA FORMATION. IDAHO BUREAU OF MINES AND GEOLOGY, PAMPHLET NO. 114, 1958, 48 PP.

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LI, T. M. SOUTHEASTERN IDAHO PHOSPHATE MINING: HOW AN ENVIRONMENTAL IMPACT STATEMENT DISTORTS GROWTH PLANS. MINING ENGINEERING, V. 30, NO. 1, 1978, PP. 25-28.

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SERVICE, A. L. AND C. C. POPOFF. AN EVALUATION OF THE WESTERN PHOSPHATE INDUSTRY AND ITS RESOURCES (IN FIVE PARTS), 1. INTRODUCTORY REVIEW: U.S. BUREAU OF MINES, REPORT OF INVESTIGATIONS 6485, 1964, 86 PP.

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THOMPSON, M. E. FURTHER STUDIES OF THE DISTRIBUTION OF URANIUM IN RICH PHOSPHATE BEDS OF THE PHOSPHORIA FORMATION: U.S. GEOLOGICAL SURVEY BULLETIN 1009-D, 1954, PP. 107-122.

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: HUSKY NO. 1 LEASE

SEQUENCE NUMBER: 0160290166

NATION: USA STATE: IDAHO

COUNTY: CARIBOU

TYPE OF OPERATION: SURFACE

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 42 DEG 41 MIN 37 SEC

LONGITUDE: W 111 DEG 14 MIN 35 SEC

UTM - ZONE: 12 HEMISPHERE: NORTHERN

NORTHING: 4726605 EASTING: 480090

POINT OF REFERENCE: GRS 80 EDDY

PRECISION: 100 METERS

ELEVATION: 2438 METERS

PRECISION: 10 METERS

LATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEDERAL LEASE

## OWNERSHIP

U. S. GOVT. - FOREST SERVICE  
AKER INDUSTRIES CORPORATION

## STATUS

OWNER  
OPERATOR

## COMMODITY

## MODIFIER

## MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

URANIUM

RECOVERABLE

VANADIUM

RECOVERABLE

FLUORINE

RECOVERABLE

RARE EARTH

RECOVERABLE

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3	RECORD 4
MEASURED	47,000,000	-----	-----	-----
INDICATED	-----	17,000,000	12,000,000	29,000,000
UNITS	MT ORE	MT ORE	MT ORE	MT ORE
YEAR/DATA	1978	1975	1975	1975

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
2	F205	26.1	WT-PCT
	U308	0.01	WT-PCT
	V205	0.07	WT-PCT
	F	2.61	WT-PCT
	RARE EARTH	0.1	WT-PCT
3	P205	17.5	WT-PCT
	U308	0.01	WT-PCT

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
3	V205	0.07	WT-PCT
	F	1.75	WT-PCT
	RARE EARTH	0.1	WT-PCT
4	P205	22.5	WT-PCT
	U308	0.01	WT-PCT
	V205	0.07	WT-PCT
	F	2.25	WT-PCT
	RARE EARTH	0.1	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORD 1: STRIPPING RATIO = 4.6 CUBIC YARDS OVERBURDEN TO 1 TON ORE.  
 RECORD 2: STRIPPING RATIO = 3.0 CUBIC YARDS OVERBURDEN TO 1 TON ORE.  
 RECORD 3: LOW GRADE RESOURCE.  
 RECORD 4: STRIPPING RATIO = 1.48 CUBIC YARDS OVERBURDEN TO 1 TON ORE; LOW PLUS MEDIUM PLUS HIGH GRADE ORE.

## SOURCE FOR RECORD 1:

U. S. GEOLOGICAL SURVEY, BUREAU OF LAND MANAGEMENT, AND FOREST SERVICE. FINAL ENVIRONMENTAL IMPACT STATEMENT/DEVELOPMENT OF PHOSPHATE RESOURCES IN SOUTHEASTERN IDAHO. FOUR VOLUMES, 1978.

## SOURCE FOR RECORD 2, 3, AND 4:

GARRAND, L. J. PHOSPHATE STUDY SOUTHEASTERN IDAHO. FOR: U. S. DEPARTMENT OF AGRICULTURE, CARIBOU NATIONAL FOREST, U. S. DEPARTMENT OF AGRICULTURE CONTRACT NO. 50-820: GARRAND CORPORATION, 1975.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

ORE-MINERAL IN PLACE

## -----EXPLORATION METHODS-----

SURFACE GEOLOGIC MAPPING/DRILLING/TRENCHING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: EDDING: LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

## LITHOLOGY:

NAME OF FORMATION: PHOSPHORIA FORMATION GEOLOGIC AGE: PERMIAN  
 DEFORMATION DESCRIPTION: MINOR FOLDING; FOLDING  
 RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION  
 GEOLOGIC AGE: MESOZOIC

## ROCK TYPE:

CHERT	LIES OVER ORE
MUDSTONE	ENCLOSES ORE; GANGUE
SHALE	ENCLOSES ORE; GANGUE
PHOSPHORITE	IS ORE
LIMESTONE	ENCLOSES ORE; GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
COLLOPHANE	PHOSPHATES	VARIABLE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
SERICITE	SILICATES	VARIABLE
HADLINITE	SILICATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
CALCITE	CARBONATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	VARIABLE
ORTHOCLASE	SILICATES	VARIABLE
CHALCOLOGY	FORMS OF SiO <sub>2</sub>	VARIABLE
PYRITE	SULFIDES	VARIABLE

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U.S. GEOLOGICAL SURVEY, BUREAU OF LAND MANAGEMENT, AND FOREST SERVICE. FINAL ENVIRONMENTAL IMPACT STATEMENT/DEVELOPMENT OF PHOSPHATE RESOURCES IN SOUTHEASTERN IDAHO. FOUR VOLUMES, 1978.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: BLACKFOOT BRIDGE SITE

SEQUENCE NUMBER: 0160290167

NATION: USA STATE: IDAHO

COUNTY: CARIBOU

TYPE OF OPERATION: SURFACE

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 42 DEG 47 MIN 06 SEC

LONGITUDE: W 111 DEG 31 MIN 14 SEC

UTM - ZONE: 12 HEMISPHERE: NORTHERN

NORTHING: 4736856 EASING: 457421

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 1981 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING

FEDERAL LEASE; STATE LEASE

PATENTED CLAIM

## OWNERSHIP

U. S. GOVT. - BUREAU OF LAND MANAGEMENT  
STATE OF IDAHO  
MONSANTO CO.

## STATUS

CWNFR

OWNER

OWNER-OPERATOR

## COMMODITY

## MODIFIER

## MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

URANIUM

RECOVERABLE

VANADIUM

RECOVERABLE

FLUORINE

RECOVERABLE

RARE EARTH

RECOVERABLE

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3	RECORD 4
MEASURED	5,400,000	-----	-----	-----
INDICATED	-----	7,000,000	2,000,000	9,000,000
UNITS	MT ORE	MT ORE	MT ORE	MT ORE
YEAR/DATA	1978	1975	1975	1975

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
2	F205	26.4	WT-PCT
	U308	0.01	WT-PCT
	V205	0.07	WT-PCT
	F	2.64	WT-PCT
	RARE EARTH	0.1	WT-PCT
?	P205	17.4	WT-PCT

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
3	U308	0.01	WT-PCT
	V205	0.07	WT-PCT
	F	1.74	WT-PCT
	RARE EARTH	0.1	WT-PCT
4	P205	24.6	WT-PCT
	U308	0.01	WT-PCT
	V205	0.07	WT-PCT
	F	2.46	WT-PCT
	RARE EARTH	0.1	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORD 1: STRIPPING RATIO = 3.0 CUBIC YARDS OVERBURDEN TO 1 TON ORE.

RECORD 2: STRIPPING RATIO = 2.8 CUBIC YARDS OVERBURDEN TO 1 TON ORE.

RECORD 3: LOW GRADE RESOURCE.

RECORD 4: STRIPPING RATIO = 2.1 CUBIC YARDS OVERBURDEN TO 1 TON ORE; LOW PLUS MEDIUM PLUS HIGH GRADE ORE.

## SOURCE FOR RECORD 1:

U.S. GEOLOGICAL SURVEY, BUREAU OF LAND MANAGEMENT, AND FOREST SERVICE. FINAL ENVIRONMENTAL IMPACT STATEMENT/DEVELOPMENT OF PHOSPHATE RESOURCES IN SOUTHEASTERN IDAHO. FOUR VOLUMES, 1978.

## SOURCE FOR RECORD 2, 3, AND 4:

GARRAND, L. J. PHOSPHATE STUDY SOUTHEASTERN IDAHO. FOR: U.S. DEPARTMENT AGRICULTURE, CARIBOU NATIONAL FOREST. U.S. DEPARTMENT OF AGRICULTURE CONTRACT NO. 50-820. GARRAND CORP., 1975.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

ORE-MINERAL IN PLACE

-----EXPLORATION METHODS-----  
SURFACE GEOLOGICAL MAPPING/DRILLING/TRENCHING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDING; LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

**LITHOLOGY:**

NAME OF FORMATION: PHOSPHORIA FORMATION GEOLOGIC AGE: PERMIAN  
 DEFORMATION DESCRIPTION: MINOR FOLDING; FOLDING  
 RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION  
 GEOLOGIC AGE: MESOZOIC

**ROCK TYPE:**

OREM	LIES OVER ORE
MUDSTONE	ENCLOSES ORE; GANGUE
SHALE	ENCLOSES ORE; GANGUE
PHOSPHORITE	IS ORE
LIMESTONE	ENCLOSES ORE; GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
COLLOPHANE	PHOSPHATES	VARIABLE
QUARTZ	FORMS OF SIC?	VARIABLE
SERICITE	SILICATES	VARIABLE
HALITE	SILICATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
CALCITE	CARBONATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE
LIMONITE	OXIDES (EXCLUDING SIC?)	VARIABLE
ORTHOCLASE	SILICATES	VARIABLE
CHALCEONY	FORMS OF SIC?	VARIABLE
FYRIT	SULFIDES	VARIABLE

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U.S. GEOLOGICAL SURVEY, BUREAU OF LAND MANAGEMENT, AND FOREST SERVICE. FINAL ENVIRONMENTAL IMPACT STATEMENT/DEVELOPMENT OF PHOSPHATE RESOURCES IN SOUTHEASTERN IDAHO. FOUR VOLUMES, 1978.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: CENTENNIAL PHOSPHATE MINE SEQUENCE NUMBER: 0160330111

NATION: USA STATE: IDAHO  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 44 DEG 33 MIN 20 SEC  
 UTM - ZONE: 12 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: URE BODY  
 ELEVATION: 2652 METERS  
 DATUM: SEA LEVEL

COUNTY: CLARK  
 CURRENT STATUS: PAST PRODUCER  
 LONGITUDE: W 111 DEG 41 MIN 27 SEC  
 NORTHING: 4933594 EASTING: 445131  
 PRECISION: 500 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEDERAL LEASE

## ALTERNATE NAMES

HURY MINE  
 TROUBLESOME RICKE PHOSPHATE DEPOSIT

OWNERSHIP  
 U. S. GOVERNMENT  
 J.R.SIMPLOT, FERTILIZER DIVISION

STATUS  
 OWNER  
 OPERATOR

COMMODITY	MODIFIER
PHOSPHATE	
URANIUM	U3O8 CONTENT
VANADIUM	PHOSPHATIC SHALE
FLUORINE	

MARKETABILITY
PRIMARY PRODUCT
RECOVERABLE
RECOVERABLE
RECOVERABLE

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT

DEPOSIT HISTORICAL INFORMATION

YEAR OF INITIAL PRODUCTION: 1956  
 YEAR OF FINAL PRODUCTION: 1958

-----EXPLORATION METHODS-----  
 SURFACE GEOLOGICAL MAPPING/CORE DRILLING/  
 TRENCHING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF URE BODY: SEDIMENTARY  
 MODE OF ORIGIN: SEDIMENTATION  
 SHAPE OF URE BODY: TABULAR  
 CONTROLLING FEATURES: BEDDING  
 DEGREE OF WALL ROCK ALTERATION: NONE

## LITHOLOGY:

NAME OF FORMATION: PHOSPHORIA FORMATION                    GEOLOGIC AGE: PERMIAN  
DEFORMATION DESCRIPTION: MINOR FOLDING; FAULTING  
RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION  
GEOLOGIC AGE: CRETACEOUS

## ROCK TYPE:

PHOSPHORITE                IS ORE  
SANDSTONE  
LIMESTONE  
CHERT  
QUARTZITE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
COLLOPHANE	PHOSPHATES	APHANITIC
QUARTZ	FORMS OF SiO <sub>2</sub>	APHANITIC

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1953.

JEMMETT. MS THESIS, UNIV. OF IDAHO. MOSCOW, IDAHO. 1955, 67 PP.

STOUT, K. DIRECTORY OF KNOWN MINING ENTERPRISES 1957. MONTANA BUREAU OF  
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MONTANALOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: RELYEAE MINE

SEQUENCE NUMBER: 0300770001

NATION: USA STATE: MONTANA  
 TYPE OF OPERATION: UNDERGROUND  
 LATITUDE: N 46 DEG 37 MIN 44 SEC  
 UTM - ZONE: 12 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: MAIN ENTRANCE  
 ELEVATIONS: 8173 METERS  
 DATUM: SEA LEVEL

COUNTY: POWELL  
 CURRENT STATUS: PAST PRODUCER  
 LONGITUDE: W 112 DEG 48 MIN 15 SEC  
 NORTHING: 5165286 EASTING: 361887  
 PRECISION: 10 METERS  
 PRECISION: 500 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING:  
 FEE OWNERSHIP

OWNERSHIP  
 GEORGE A. RELYEAE, GARRISON, MONTANA

STATUS  
 OWNER

COMMODITY	MODIFIER
PHOSPHATE	
URANIUM	U3O8 CONTENT
VANADIUM	PHOSPHATIC SHALE
FLUORINE	FLUORSFAR

MARKETABILITY
PRIMARY PRODUCT
RECOVERABLE
RECOVERABLE
RECOVERABLE

PUBLISHED RESERVE-RESOURCE INFORMATION

RECORD 1	
MEASURED	300,000
INDICATED	400,000
INFERRED	100,000
UNITS	MT ORE
YEAR/DATA	1981

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	F205	32	WT-PCT

RESERVE-RESOURCE - REMARKS

## SOURCES FOR RECORD 1:

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 ITS RESOURCES, PART 2, MONTANA. U.S.G.M. RI 6611, 1965.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 FREE-MINERAL IN PLACE  
 YEAR OF DISCOVERY: 1946  
 YEAR OF INITIAL PRODUCTION: 1947  
 YEAR OF FINAL PRODUCTION: 1976

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
MODE OF ORIGIN: SEDIMENTATION  
SHAPE OF ORE BODY: TABULAR  
CONTROLLING FEATURES: BEDDING; FAULTING  
DEGREE OF WALL ROCK ALTERATION: NONE

## LITHOLOGY:

NAME OF FORMATION: PHOSPHORIA FORMATION      GEOLOGIC AGE: PERMIAN  
DEFORMATION DESCRIPTION: MINOR FOLDING; FAULTING  
ROCK TYPE:

PHOSPHORITE	IS ORE
SANDSTONE	LIES OVER ORE; LIES UNDER ORE
LIMESTONE	LIES OVER ORE; LIES UNDER ORE
CHERT	LIES OVER ORE; LIES UNDER ORE
QUARTZITE	LIES OVER ORE; LIES UNDER ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
COLLOPHANE	PHOSPHATES
QUARTZ	FORMS OF SiO <sub>2</sub>
CALCITE	CARBONATES
MONTMORILLONITE	SILICATES

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MONTANA BUREAU OF MINES AND GEOLOGY. BULL. 95, 1975, PP. 36.

POPOFF, C. C. AN EVALUATION OF THE WESTERN PHOSPHATE INDUSTRY AND ITS  
RESOURCES, PART 2, MONTANA. U.S.B.M. RI 6611, 1965.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: WARM SPRINGS CREEK  
 PHOSPHATE MINE  
 NATION: USA STATE: MONTANA  
 TYPE OF OPERATION: UNDERGROUND  
 LATITUDE: N 46 DEG 36 MIN 23 SEC  
 UTM - ZONE: 12 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: MAIN ENTRANCE  
 ELEVATION: 1475 METERS  
 DATUM: SEA LEVEL

SEQUENCE NUMBER: 0300770214

COUNTY: POWELL  
 CURRENT STATUS: PRODUCER  
 LONGITUDE: W 112 DEG 46 MIN 48 SEC  
 NORTHING: 5162745 EASTING: 363680  
 PRECISION: 100 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 PATENTED CLAIM; FEDERAL LEASE

## ALTERNATE NAMES

BISHOP ASIT  
 SPOKANE CHEMICAL CO. WORKINGS  
 ANDERSON MINE  
 BROCK MINE

OWNERSHIP  
 COMINCO, SPOKANE  
 US GOVERNMENT

STATUS  
 OWNER-OPERATOR  
 OWNER

COMMUNITY  
 PHOSPHATE  
 FLUORITE  
 URANIUM  
 VANADIUM

MARKETABILITY  
 PRIMARY PRODUCT  
 RECOVERABLE  
 RECOVERABLE  
 RECOVERABLE

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED JANUARY 1981 RESERVE TONNAGE FOR IDAHO AND MONTANA IS 352 MILLION METRIC TONS OF ORE AT AN IN SITU GRADE OF 25.6% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, DEMONSTRATED RESERVES OF THIS DEPOSIT.

SOURCE: FANTZ, R. J., D. E. SULLIVAN, AND G. R. PETERSON. PHOSPHATE ROCK AVAILABILITY - DOMESTIC, A MINERALS AVAILABILITY PROGRAM APPRAISAL. BUMINES I. C. (IN PRESS).

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 CORE-MINERAL IN PLACE  
 YEAR OF DISCOVERY: 1912  
 YEAR OF INITIAL PRODUCTION: 1929

-----EXPLORATION METHODS-----  
 SURFACE GEOLOGICAL MAPPING/  
 SURFACE GEOLOGICAL MAPPING/CORE DRILLING/  
 TEST ADIT/TEST DRIFT/CROSSCUT/TEST PIT/  
 TRENCHING/BEDROCK SAMPLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
 MODE OF ORIGIN: SEDIMENTATION  
 SHAPE OF ORE BODY: TABULAR  
 CONTROLLING FEATURES: BEDDING; LITHOLOGY  
 DEGREE OF WALL ROCK ALTERATION: NONE

## LITHOLOGY:

NAME OF FORMATION: PHOSPHORIA FORMATION      GEOLOGIC AGE: PERMIAN  
 DEFORMATION DESCRIPTION: MINOR FOLDING; FAULTING  
 RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION  
 GEOLOGIC AGE: OLDER THAN CRETACEOUS

ROCK TYPE:  
 CHERT  
 LIES OVER ORE; LIES UNDER ORE  
 SANDSTONE    LIES OVER ORE; LIES UNDER ORE  
 QUARTZITE    LIES OVER ORE  
 PHOSPHORITE                                        IS ORE  
 CONGLOMERATE                                        LIES UNDER ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
APATITE	PHOSPHATES	PHANERITIC-FINE
QUARTZ	FORMS OF SiO <sub>2</sub>	PHANERITIC-FINE

MINE/MILL INFORMATION

## UNDERGROUND MINING:

METHOD: ROOM AND PILLAR  
 CHARACTERISTIC OF ROCK: MULTIPLE SYSTEMS OF WEAKNESS PLANES  
 ROCK AND WATER CONDITIONS: HARDROCK WITH LITTLE WATER  
 ROCK/MINE SUPPORT: SUPPORTING MAY BACK SLAB; TIMBER  
 CONDITION OF WORKINGS: OPEN

## BENEFICIATION:

METHOD: SIZING	-----DESCRIPTION OF MILLING-----
	ORE FROM CRUSHER IS SCREENED/-•.95 CM TO ORE BIN/ +•.95-CRUSHER

PRODUCT	ASSAY FORM
P205 ROCK	P205

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK  
 ORIGINATING FACILITY: MILL (ON-SITE)  
 LOCATION: USA MONTANA

LATITUDE: N 46 36 23	LONGITUDE: W 112 46 48
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: TRUCK; RAIL	
DESTINATION FACILITY: REFINERY	LOCATION: CANADA
LATITUDE: N 49 40 00	LONGITUDE: W 116 00 00

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NORTH CAROLINALOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: NORTH CAROLINA PHOSPHATE CORP. SEQUENCE NUMBER: 0370130001

NATION: USA	STATE: NORTH CAROLINA	COUNTY: BEAUFORT
TYPE OF OPERATION: SURFACE		CURRENT STATUS: DEVELOPING DEPOSIT
LATITUDE: N 35 DEG 20 MIN 00 SEC		LONGITUDE: W 76 DEG 46 MIN 17 SEC
UTM - ZONE: 18	HEMISPHERE: NORTHERN	NORTHING: 3911250 EASTING: 339003
POINT OF REFERENCE: ORE BODY		PRECISION: 1 KILOMETER
ELEVATION: 3 METERS		PRECISION: 10 METERS
DATUM: SEA LEVEL		YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

OWNERSHIP	STATUS
NORTH CAROLINA PHOSPHATE CORPORATION	OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABLITY
ALUMINUM	ALUMINA	AFFECT MARKETABLITY
MAGNESIUM	OXIDE	AFFECT MARKETABLITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR GEORGIA, NORTH CAROLINA, AND SOUTH CAROLINA IS 20.971 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 8.79% OF P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF GEORGIA, NORTH CAROLINA, AND SOUTH CAROLINA USING THE MINERALS AVAILABILITY SYSTEM. EUMINES OPEN FILE REPORT 14-79, 1978, 65 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:	-----EXPLORATION METHODS-----
GEOLOGICAL INFERENCE	CORE DRILLING/RADIOACTIVITY SURVEY
YEAR OF DISCOVERY: 1951	

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

**LITHOLOGY:**

NAME OF FORMATION: PUNGO RIVER FORMATION

GEOLOGIC AGE: MIOCENE

**ROCK TYPE:**

PHOSPHORITE	IS OFF
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
LIMESTONE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
FRANCOLITE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
CALCITE	CARBONATES	VARIABLE

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ZELLARS-WILLIAMS, INC. EVALUATION OF THE PHOSPHATE DEPOSITS OF GEORGIA, NORTH CAROLINA, AND SOUTH CAROLINA USING THE MINERALS AVAILABILITY SYSTEM. HUMITIES OPEN FILE REPORT 14-79, 1978, 65 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: PUNGO RIVER DEPOSIT      SEQUENCE NUMBER: 0370130008

NATION: USA      STATE: NORTH CAROLINA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 35 DEG 28 MIN 48 SEC  
 UTM - ZONE: 18      HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 2 METERS  
 DATUM: SEA LEVEL

COUNTY: BEAUFORT  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 76 DEG 30 MIN 50 SEC  
 NORTHING: 3927129      EASTING: 362659  
 PRECISION: 500 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP: STATE LEASE

OWNERSHIP	STATUS
FMC INC.	OWNER
STATE OF NORTH CAROLINA	OWNER
NUMEROUS SMALL OWNERS	OWNER

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U3O8 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR GEORGIA, NORTH CAROLINA, AND SOUTH CAROLINA IS 20.971 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 8.79% OF P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF GEORGIA, NORTH CAROLINA, AND SOUTH CAROLINA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 14-79, 1978, 65 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE  
 YEAR OF DISCOVERY: 1950

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; REPLACEMENT; DISSEMINATED

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: LITHOLOGY; CONTACT ZONE

DEGREE OF WALL ROCK ALTERATION: MODERATE

## LITHOLOGY:

NAME OF FORMATION: PUNGO RIVER FORMATION

GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: LEE CREEK MINE	SEQUENCE NUMBER: 0370130009
NATION: USA STATE: NORTH CAROLINA	COUNTY: BEAUFORT
TYPE OF OPERATION: SURFACE	CURRENT STATUS: PRODUCER
LATITUDE: N 35 DEG 23 MIN 03 SEC	LONGITUDE: W 76 DEG 47 MIN 37 SEC
UTM - ZONE: 18 HEMISPHERE: NORTHERN	NORTHING: 3916925 EASTING: 337086
POINT OF REFERENCE: PLANT	PRECISION: 100 METERS
ELEVATION: 3 METERS	PRECISION: 10 METERS
DATUM: SEA LEVEL	YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

OWNERSHIP	STATUS
TEXASGULF CHEMICALS COMPANY	OWNER-OPERATOR

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR GEORGIA, NORTH CAROLINA, AND SOUTH CAROLINA IS 20.971 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 8.79% OF P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF GEORGIA, NORTH CAROLINA, AND SOUTH CAROLINA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 14-79, 1978, 65 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:	-----EXPLORATION METHODS-----
GEOLOGICAL INFERENCE	CORE DRILLING/RADIOACTIVITY SURVEY
YEAR OF DISCOVERY: 1951	
YEAR OF INITIAL PRODUCTION: 1966	

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED; REPLACEMENT  
 MODEL OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: MASSIVE; IRREGULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

## LITHOLOGY:

NAME OF FORMATION:	PUNGO RIVER FORMATION	GEOLOGIC AGE:	MIocene
ROCK TYPE:			
PHOSPHORITE	IS ORE		
SAND	GANGUE		
SILT	GANGUE		
CLAY	GANGUE		
LIMESTONE	GANGUE		

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
GUARIT?	FORMS OF SiO <sub>2</sub>	VARIABLE
FRANCOLITE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: STRIPPING  
 DESCRIPTION OF COVER:  
 60 PERCENT SAND, SILT  
 40 PERCENT QUICKSAND  
 PERCENT WASTE ROCK: 71.4  
 BENCH HEIGHT: 18 METERS

HARDNESS OF ORE:  
 QUICKSAND

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE  
 LATITUDE: N 35 23 03  
 PERCENT SHIPPED: 100  
 METHOD OF TRANSPORTATION: PIPELINE  
 DESTINATION FACILITY: MILL (ON-SITE)  
 LATITUDE: N 35 23 03

LOCATION: USA NORTH CAROLINA  
 LONGITUDE: W 76 47 37  
 DISTANCE (KM): 3.2  
 LOCATION: USA NORTH CAROLINA  
 LONGITUDE: W 76 47 37

## ENRICHMENT:

METHOD: FLOTATION

-----DESCRIPTION OF MILLING-----  
 ORE/SLURRY/SCREEN/WASH/FEED TO  
 FLOTATION/PRODUCT TO STORAGE/CLAY  
 TO DISPOSAL

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK  
ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: USA NORTH CAROLINA  
LATITUDE: N 35 23 03 LONGITUDE: W 76 47 37  
PERCENT SHIPPED: 100  
METHOD OF TRANSPORTATION: CONVEYOR DISTANCE (KM): 0.32  
DESTINATION FACILITY: REFINERY (ON-SITE) LOCATION: USA  
NORTH CAROLINA  
LATITUDE: N 35 23 03 LONGITUDE: W 76 47 37

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: PAMLICO RIVER DEPOSIT

SEQUENCE NUMBER: 0370130017

NATION: USA STATE: NORTH CAROLINA  
 TYPE OF OPERATION: MINERAL LOCATION  
 LATITUDE: N 35 DEG 24 MIN 15 SEC  
 UTM - ZONE: 18 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 3 METERS  
 DATUM: SEA LEVEL

COUNTY: BEAUFORT  
 CURRENT STATUS: EXPROLED DEPOSIT  
 LONGITUDE: W 76 DEG 47 MIN 30 SEC  
 NORTHING: 3919140 EASTING: 337302  
 PRECISION: 500 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP: STATE LEASE

OWNERSHIP  
 STATE OF NORTH CAROLINA  
 TEXASOULF INCORPORATED

STATUS  
 OWNER  
 OPERATOR

COMMODITY	MODIFIER
PHOSPHATE	
FLUORINE	
URANIUM	U3O8 CONTENT
IRON	FERRIC OXIDE
ALUMINUM	ALUMINA
MAGNESIUM	OXIDE
WATER CONTENT	FREE WATER

MARKETABILITY  
 PRIMARY PRODUCT  
 RECOVERABLE  
 RECOVERABLE  
 AFFECT MARKETABILITY  
 AFFECT MARKETABILITY  
 AFFECT MARKETABILITY

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR GEORGIA, NORTH CAROLINA, AND SOUTH CAROLINA IS 20.971 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 8.7% OF P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF GEORGIA, NORTH CAROLINA, AND SOUTH CAROLINA USING THE MINERALS AVAILABILITY SYSTEM. GUMINES OPEN FILE REPORT 14-79, 1978, 65 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOLOGICAL INFERENCE  
 YEAR OF DISCOVERY: 1950

-----EXPLORATION METHODS-----  
 CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; REPLACEMENT; DISSEMINATED  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: TABULAR  
 CONTROLLING FEATURES: LITHOLOGY; CONTACT ZONE

**LITHOLOGY:**

NAME OF FORMATION: PUNGO RIVER FORMATION

GEOLOGIC AGE: MIOCENE

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SIO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

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NORTH CAROLINA, AND SOUTH CAROLINA USING THE MINERALS AVAILABILITY SYSTEM.  
BUMINES OPEN FILE REPORT 14-79, 65 PP.

SOUTH CAROLINALOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: COOSAWHATCHEE REGION DEPOSITS      SEQUENCE NUMBER: 0450130001

NATION: USA      STATE: SOUTH CAROLINA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 32 DEG 32 MIN 38 SEC  
 UTM - ZONE: 17      HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: CRE BODY  
 ELEVATION: 15 METERS  
 DATUM: SEA LEVEL

COUNTY: BEAUFORT  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 80 DEG 46 MIN 23 SEC  
 NORTHING: 3600556      EASTING: 521309  
 PRECISION: 500 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEES OWNERSHIP

OWNERSHIP  
 STATE OF SOUTH CAROLINA  
 PRIVATE CORPORATIONS AND OWNERS

STATUS  
 OWNER  
 OWNER

COMMODITY	MODIFIER
PHOSPHATE	
FLUORINE	
URANIUM	U308 CONTENT
IRON	FERRIC OXIDE
ALUMINUM	ALUMINA
MAGNESIUM	OXIDE
WATER CONTENT	FREE WATER

MARKETABILITY
PRIMARY PRODUCT
RECOVERABLE
RECOVERABLE
AFFECT MARKETABILITY
AFFECT MARKETABILITY
AFFECT MARKETABILITY

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR GEORGIA, NORTH CAROLINA, AND SOUTH CAROLINA IS 20.971 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 8.7% OF P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF GEORGIA, NORTH CAROLINA, AND SOUTH CAROLINA USING THE MINERALS AVAILABILITY SYSTEM. SUMMIES OPEN FILE REPORT 14-79, 1978, 65 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 CRE-MINERAL IN PLACE  
 YEAR OF DISCOVERY: 1963

-----EXPLORATION METHODS-----  
 AUGER/CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; REPLACEMENT; DISSEMINATED

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: IRREGULAR; MASSIVE

CONTROLLING FEATURES: LITHOLOGY; CONTACT ZONE

## LITHOLOGY:

NAME OF FORMATION: HAWTHORN FORMATION      GEOLOGIC AGE: MIocene

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: CHARLESTON REGION DEPOSITS

SEQUENCE NUMBER: 0450190010

NATION: USA STATE: SOUTH CAROLINA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 32 DEG 46 MIN 30 SEC  
 UTM - ZONE: 17 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 10 METERS  
 DATUM: SEA LEVEL

COUNTY: CHARLESTON  
 CURRENT STATUS: PAST PRODUCER  
 LONGITUDE: W 80 DEG 56 MIN 28 SEC  
 NORTHING: 3626155 EASTING: 505515  
 PRECISION: 500 METERS  
 PRECISION: 10 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

OWNERSHIP  
 STATE OF SOUTH CAROLINA  
 PRIVATE OWNERS UNDETERMINED

STATUS  
 OWNER  
 UNKNOWN

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
FLUORINE		RECOVERABLE
URANIUM	U308 CONTENT	RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
MAGNESIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR GEORGIA, NORTH CAROLINA, AND SOUTH CAROLINA IS 20.971 BILLION METRIC TONS OF ORE AT AN EXTRACTABLE GRADE OF 8.79% OF P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF GEORGIA, NORTH CAROLINA, AND SOUTH CAROLINA USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 14-79, 1978, 65 PP.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

ORE-MINERAL IN PLACE

YEAR OF DISCOVERY: 1867

YEAR OF INITIAL PRODUCTION: 1867

YEAR OF FINAL PRODUCTION: 1938

## -----EXPLORATION METHODS-----

SURFACE GEOLOGICAL MAPPING/AUGER/  
CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; REPLACEMENT; DISSEMINATED

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: LITHOLOGY; CONTACT ZONE

DEGREE OF WALL ROCK ALTERATION: MODERATE

## LITHOLOGY:

NAME OF FORMATION: COOPER FORMATION      GEOLOGIC AGE: OLIGOCENE

## ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	GANGUE
SILT	GANGUE
CLAY	GANGUE
DOLOMITE	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
COLLOPHANE	PHOSPHATES	VARIABLE
MONTMORILLONITE	SILICATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

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TENNESSEELOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: HOOKER CHEMICAL PROPERTIES SEQUENCE NUMBER: 0471190081

NATION: USA STATE: TENNESSEE COUNTY: MAURY  
 TYPE OF OPERATION: SURFACE CURRENT STATUS: PRODUCER  
 LATITUDE: N 35 DEG 39 MIN 31 SEC LONGITUDE: W 87 DEG 02 MIN 36 SEC  
 UTM - ZONE: 16 HEMISPHERE: NORTHERN NORTHING: 3945885 EASTING: 496077  
 POINT OF REFERENCE: PLANT PRECISION: 500 METERS  
 ELEVATION: 262 METERS PRECISION: 10 METERS  
 DATUM: SEA LEVEL YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP: PRIVATE LEASE

OWNERSHIP	STATUS	
HOOKER CHEMICAL	OWNER-OPERATOR	
COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE	PHOSPHORUS	PRIMARY PRODUCT
FLUORINE		RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
CALCIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	AFFECT MARKETABILITY

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR TENNESSEE IS 71.672 MILLION METRIC TONS OF ORE AT AN IN SITU GRADE OF 20.9% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF TENNESSEE USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 13 - 79, 1978, 37 FP..

DEPOSIT CONSISTS OF 70 SMALL DEPOSITS IN GILES, HICKMAN, MAURY, AND WILLIAMSON COUNTIES.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 ORE-MINERAL IN PLACE  
 YEAR OF DISCOVERY: 1893  
 YEAR OF INITIAL PRODUCTION: 1941

-----EXPLORATION METHODS-----  
 AUGER

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; REPLACEMENT; DISSEMINATED  
 MODE OF ORIGIN: RESIDUAL CONCENTRATION; SEDIMENTATION  
 SHAPE OF ORE BODY: IRREGULAR; TABULAR  
 CONTROLLING FEATURES: BEDDING; LITHOLOGY

## LITHOLOGY:

NAME OF FORMATION:	BIGBY-CANNON LIMESTONE	GEOLOGIC AGE:	MIDDLE ORDOVICIAN
ROCK TYPE:			
PHOSPHORITE	IS ORE		
LIMESTONE	LIES UNDER ORE		
SAND	GANGUE		
CLAY	GANGUE		
CHERT	GANGUE		
DOLOMITE	GANGUE		

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
COLLOPHANE	PHOSPHATES	VARIABLE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
CALCITE	CARBONATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

MINE/MILL INFORMATION  
ORE FEED TO WASHER-GODWIN

## SURFACE MINING:

METHOD:	STRIPPING	HARDNESS OF ORE:	
DESCRIPTION OF COVER:		SAND, SILT	
100 PERCENT SAND, SILT		SLOPE OF PIT:	65 DEGREES
PERCENT WASTE ROCK:	66.6		

## TRANSPORTATION (ORE):

ORIGINATING FACILITY:	MINE	LOCATION:	USA TENNESSEE
PERCENT SHIPPED:	100	DISTANCE (KM):	19 (AVERAGE)
METHOD OF TRANSPORTATION:	TRUCK	LOCATION:	WASHER-GODWIN, TENNESSEE
DESTINATION FACILITY:	MILL (OFF-SITE)	LONGITUDE:	W 87 02 36
LATITUDE:	N 35 39 31		

## BENEFICIATION:

METHOD:	WASHING	-----DESCRIPTION OF MILLING-----
		ORE/SLUICE/SCREEN/CRUSH/WASH/CLASSIFY/
		CLAY TO DISPOSAL

## TRANSPORTATION FOR PRODUCT: PHOSPHATE CONCENTRATE

ORIGINATING FACILITY:	MILL (OFF-SITE)	LOCATION:	WASHER-GODWIN, TENNESSEE
LATITUDE:	N 35 39 31	LONGITUDE:	W 87 02 36
METHOD OF TRANSPORTATION:	TRUCK	DISTANCE (KM):	0
DESTINATION FACILITY:	SMELTER(ON-SITE)	LOCATION:	FURNACE-GODWIN, TENNESSEE
LATITUDE:	N 35 39 31	LONGITUDE:	W 87 02 36

MINE/MILL INFORMATION  
ORE FEED TO WASHER-WILLIAMSPORT

## SURFACE MINING:

METHOD: STRIPPING

DESCRIPTION OF COVER:

SAND, SILT 100 PERCENT

PERCENT WASTE ROCK: 66.6

HARDNESS OF ORE:

SAND, SILT

SLOPE OF PIT: 65 DEGREES

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: TRUCK

DESTINATION FACILITY: MILL (OFF-SITE)

LATITUDE: N 35 41 25

LOCATION: USA TENNESSEE

DISTANCE (KM): 19 (AVERAGE)

LOCATION: WILLIAMSPORT, TENNESSEE

LONGITUDE: W 85 12 55

## BENEFICIATION:

METHOD: WASHING

-----DESCRIPTION OF MILLING-----  
 ORE/SLUICE/SCREEN/CRUSH/WASH/CLASSIFY/  
 CLAY TO DISPOSAL

## TRANSPORTATION FOR PRODUCT: PHOSPHATE CONCENTRATE

ORIGINATING FACILITY: MILL (OFF-SITE)

LATITUDE: N 35 41 25

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: TRUCK

DESTINATION FACILITY: SMELTER

LATITUDE: N 35 39 31

LOCATION: WASHER-WILLIAMSPORT

LONGITUDE: W 85 12 55

DISTANCE (KM): 24 (AVERAGE)

LOCATION: FURNACE-GODWIN, TENN.

LONGITUDE: W 87 02 36

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: TENNESSEE VALLEY AUTHORITY RESERVES  
 NATION: USA STATE: TENNESSEE  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 35 DEG 22 MIN 12 SEC  
 UTM - ZONE: 16 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: PLANT  
 ELEVATION: 260 METERS  
 DATUM: SEA LEVEL

SEQUENCE NUMBER: 0471190082  
 COUNTY: MAURY  
 CURRENT STATUS: PAST PRODUCER  
 LONGITUDE: W 87 DEG 34 MIN 48 SEC  
 NORTHING: 3914031 EASTING: 447311  
 PRECISION: 100 METERS  
 YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP; MINERALS ONLY

OWNERSHIP	STATUS
TENNESSEE VALLEY AUTHORITY	OWNER-OPERATOR

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE	PHOSPHORUS	PRIMARY PRODUCT
FLUORINE		RECOVERABLE
IRON	FERRIC OXIDE	RECOVERABLE
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
CALCIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR TENNESSEE IS 71.672 MILLION METRIC TONS OF ORE AT AN IN SITU GRADE OF 20.9% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF TENNESSEE USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 13 - 79, 1978, 37 PP..

DEPOSITS CONSISTS OF 37 SMALL DEPOSITS IN GILES AND WILLIAMSON COUNTIES.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 ORE-MINERAL IN PLACE  
 YEAR OF DISCOVERY: 1893  
 YEAR OF INITIAL PRODUCTION: 1942 .  
 YEAR OF FINAL PRODUCTION: 1977

-----EXPLORATION METHODS-----  
 AUGER

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSITS

TYPE OF ORE BODY: SEDIMENTARY; REPLACEMENT; DISSEMINATED

MODE OF ORIGIN: RESIDUAL CONCENTRATION; SEDIMENTATION

SHAPE OF ORE BODY: IRREGULAR; TABULAR

CONTROLLING FEATURES: BEDDING; LITHOLOGY

## LITHOLOGY:

NAME OF FORMATION: EIGBY-CANNON LIMESTONE GEOLOGIC AGE: MIDDLE ORDOVICIAN

## ROCK TYPE:

PHOSPHORITE

IS ORE

LIMESTONE

LIES UNDER ORE

SAND

GANGUE

CLAY

GANGUE

## MINERALIZATION:

MINERAL NAME

MINERAL CLASS

GRAIN SIZE

COLL OF HANE

PHOSPHATES

VARIABLE

QUARTZ

FORMS OF SiO<sub>2</sub>

VARIABLE

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: MOBIL CHEMICAL COMPANY SEQUENCE NUMBER: 0471190083

NATION: USA STATE: TENNESSEE COUNTY: MAURY  
 TYPE OF OPERATION: SURFACE CURRENT STATUS: PAST PRODUCER  
 LATITUDE: N 35 DEG 16 MIN 48 SEC LONGITUDE: W 87 DEG 05 MIN 24 SEC  
 UTM - ZONE: 16 HEMISPHERE: NORTHERN NORTHING: 3903900 EASTING: 491815  
 POINT OF REFERENCE: PLANT PRECISION: 10 KILOMETERS  
 ELEVATION: 215 METERS PRECISION: 100 METERS  
 DATUM: SEA LEVEL YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP: MINERALS ONLY

OWNERSHIP	STATUS
MOBIL CHEMICAL COMPANY	OWNER-OPERATOR

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE	PHOSPHORUS	PRIMARY PRODUCT
FLUORINE		RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
CALCIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR TENNESSEE IS 71.672 MILLION METRIC TONS OF ORE AT AN IN SITU GRADE OF 20.9% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF TENNESSEE USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 13 - 79, 1978, 37 PP..

DEPOSIT CONSISTS OF 29 SMALL DEPOSITS IN GILES AND MAURY COUNTIES.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

ORE-MINERAL IN PLACE

YEAR OF DISCOVERY: 1896

YEAR OF INITIAL PRODUCTION: 1898

YEAR OF FINAL PRODUCTION: 1970

## -----EXPLORATION METHODS-----

AUGER

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; REPLACEMENT; DISSEMINATED

MODE OF ORIGIN: RESIDUAL CONCENTRATION; SEDIMENTATION

SHAPE OF ORE BODY: IRREGULAR; TABULAR

CONTROLLING FEATURES: BEDDING; LITHOLOGY

## LITHOLOGY:

NAME OF FORMATION: EIGRY-CANNON LIMESTONE GEOLOGIC AGE: MIDDLE ORDOVICIAN

## ROCK TYPE:

PHOSPHORITE	IS ORE
LIMESTONE	LIES UNDER ORE
SAND	GANGUE
CLAY	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
COLL. OF PHASE	PHOSPHATES	VARIABLE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: STAUFFER CHEMICAL CO. PROPERTIES	SEQUENCE NUMBER: 0471190084
NATION: USA STATE: TENNESSEE	COUNTY: MAURY
TYPE OF OPERATION: SURFACE	CURRENT STATUS: PRODUCER
LATITUDE: N 35 DEG 32 MIN 15 SEC	LONGITUDE: W 87 DEG 10 MIN 00 SEC
UTM - ZONE: 16 HEMISPHERE: NORTHERN	NORTHING: 3932466 EASTING: 484891
POINT OF REFERENCE: PLANT	PRECISION: 10 KILOMETERS
ELEVATION: 200 METERS	PRECISION: 100 METERS
DATUM: SEA LEVEL	YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP; MINERALS ONLY;  
 PRIVATE LEASE

ALTERNATE NAMES  
 GLOBE MINE

OWNERSHIP	STATUS
STAUFFER CHEMICAL COMPANY	OWNER
PRESSNELL PHOSPHATE COMPANY	OPERATOR
OTHERS (UNKNOWN)	OPERATOR

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE	PHOSPHORUS	PRIMARY PRODUCT
FLUORINE		RECOVERABLE
IRON	FERRIC OXIDE	AFFECT MARKETABILITY
ALUMINUM	ALUMINA	AFFECT MARKETABILITY
CALCIUM	OXIDE	AFFECT MARKETABILITY
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR TENNESSEE IS 71.672 MILLION METRIC TONS OF ORE AT AN IN SITU GRADE OF 20.9% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF TENNESSEE USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 13 - 79, 1978, 37 PP..

DEPOSIT CONSISTS OF 78 SMALL DEPOSITS IN GILES, MAURY, AND WILLIAMSON COUNTIES.

DEPOSIT\_HISTORICAL\_INFORMATION

## DISCOVERY METHOD:

CRE-MINERAL IN PLACE

## -----EXPLORATION METHODS-----

AUGER

YEAR OF DISCOVERY: 1893

YEAR OF INITIAL PRODUCTION: 1936

GEOLOGIC\_AND\_SPATIAL\_CHARACTERISTICS\_OF\_DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; REPLACEMENT; DISSEMINATED

MODE OF ORIGIN: RESIDUAL CONCENTRATION; SEDIMENTATION

SHAPE OF ORE BODY: IRREGULAR; TABULAR

CONTROLLING FEATURES: BEDDING; LITHOLOGY

## LITHOLOGY:

NAME OF FORMATION: BIGBY-CANNON LIMESTONE GEOLOGIC AGE: MIDDLE ORDOVICIAN

## ROCK TYPE:

PHOSPHORITE	IS ORE
LIMESTONE	LIES UNDER ORE
SAND	GANGUE
CLAY	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
COLLOPHANE	PHOSPHATES	VARIABLE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE

MINE/MILL\_INFORMATION  
ORE FEED TO STAUFFER PLANT

## SURFACE MINING:

METHOD: STRIPPING

## DESCRIPTION OF COVER:

100 PERCENT QUICKSAND

PERCENT WASTE ROCK: 83.0

## HARDNESS OF ORE:

QUICKSAND

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE

LOCATION: USA TENNESSEE

LATITUDE: N 35 32 06

LONGITUDE: W 87 01 48

PERCENT SHIPPED: 100

DISTANCE (KM): 31

METHOD OF TRANSPORTATION: TRUCK

LOCATION: WASHER-MT. PLEASANT, TENN.

DESTINATION FACILITY: MILL (OFF-SITE)

LONGITUDE: W 87 10 00

LATITUDE: N 35 32 15

## BENEFICIATION:

METHOD: WASHING

## -----DESCRIPTION OF MILLING-----

ORE/CRUSHED/SCREENED/WASHED/FINES TO CYCLOCNES/TAILINGS TO PONDS/SAND PRODUCT/TAILINGS TO PONDS/SAND PRODUCT

TRANSPORTATION FOR PRODUCT: PHOSPHATE CONCENTRATE  
 ORIGINATING FACILITY: MILL (OFF-SITE) LOCATION: WASHER-MT. PLEASANT, TENN.  
 LATITUDE: N 35 32 15 LONGITUDE: W 87 10 00  
 PERCENT SHIPPED: 100  
 METHOD OF TRANSPORTATION: TRUCK DISTANCE (KM): 5  
 DESTINATION FACILITY: SMELTER LOCATION: FURNACE-MT. PLEASANT, TENN.  
 LATITUDE: N 35 33 00 LONGITUDE: W 87 13 00

MINE/MILL INFORMATION  
ORE FEED TO CONTRACTED PLANT

SURFACE MINING:

METHOD: STRIPPING  
 DESCRIPTION OF COVER:  
 QUICKSAND 100 PERCENT  
 PERCENT WASTE ROCK: 83.0

HARDNESS OF ORE:  
 QUICKSAND

TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE LOCATION: USA TENNESSEE  
 LATITUDE: N 35 40 00 LONGITUDE: W 87 05 00  
 METHOD OF TRANSPORTATION: TRUCK DISTANCE (KM): 14  
 DESTINATION FACILITY: MILL (OFF-SITE) LOCATION: WASHER-COLUMBIA, TENN.  
 LATITUDE: N 35 39 40 LONGITUDE: W 87 01 45

BENEFICIATION:

METHOD: WASHING

-----DESCRIPTION OF MILLING-----  
 ORE/CRUSHED/SCREENED/WASHED/FINES TO  
 CYCLONES/TAILINGS TO PONDS/SAND PRODUCT/  
 TAILINGS TO PONDS/SAND PRODUCT

TRANSPORTATION FOR PRODUCT: PHOSPHATE CONCENTRATE

ORIGINATING FACILITY: MILL (OFF-SITE) LOCATION: WASHER-COLUMBIA, TENN.  
 LATITUDE: N 35 39 40 LONGITUDE: W 87 01 45  
 PERCENT SHIPPED: 100  
 METHOD OF TRANSPORTATION: TRUCK DISTANCE (KM): 25  
 DESTINATION FACILITY: SMELTER LOCATION: FURNACE-MT. PLEASANT, TENN.  
 LATITUDE: N 35 33 00 LONGITUDE: W 87 13 00

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 USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 13-79,  
 1978. 37 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: M. C. WEST PROPERTIES

SEQUENCE NUMBER: 0471190085

NATION: USA STATE: TENNESSEE  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 35 DEG 46 MIN 14 SEC  
 UTM - ZONE: 16 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: GRS 80 BODY  
 ELEVATION: 215 METERS  
 DATUM: SEA LEVEL

COUNTY: MAURY  
 CURRENT STATUS: PRODUCER  
 LONGITUDE: W 87 DEG 16 MIN 56 SEC  
 NCRTHING: 3958337 EASTING: 474489  
 PRECISION: 100 METERS  
 YEAR OF INFORMATION: 1979

## TYPE OF MINERAL HOLDING

PRIVATE LEASE; FEE OWNERSHIP

## ALTERNATE NAMES

TENNESSEE OPERATIONS  
HICKMAN AND MAURY CO. PROPERTIES

## OWNERSHIP

M.C. WEST, INC.

## STATUS

OWNER-OPERATOR

COMMODITY	MODIFIER
PHOSPHATE	PHOSPHORUS
FLUORINE	
IRON	FERRIC OXIDE
ALUMINUM	ALUMINA
CALCIUM	OXIDE
WATER CONTENT	FREE WATER

MARKETABILITY
PRIMARY PRODUCT
RECOVERABLE
AFFECT MARKETABILITY
AFFECT MARKETABILITY
AFFECT MARKETABILITY

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR TENNESSEE IS 71.672 MILLION METRIC TONS OF ORE AT AN IN SITU GRADE OF 20.9% P2O5. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF TENNESSEE USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 13 - 79, 1978, 37 PP..

DEPOSIT CONSISTS OF 4 SMALL DEPOSITS IN HICKMAN AND MAURY COUNTIES.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

ORE-MINERAL IN PLACE

YEAR OF INITIAL PRODUCTION: 1939

## -----EXPLORATION METHODS-----

AUGER

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; REPLACEMENT; DISSEMINATED  
 MODE OF ORIGIN: RESIDUAL CONCENTRATION; SEDIMENTATION  
 SHAPE OF ORE BODY: IRREGULAR; TABULAR  
 CONTROLLING FEATURES: BEDDING; LITHOLOGY

## LITHOLOGY:

NAME OF FORMATION: BIGBY-CANNON LIMESTONE GEOLOGIC AGE: MIDDLE ORDOVICIAN

## ROCK TYPE:

PHOSPHORITE	IS ORE
LIMESTONE	OTHER
SILT	GANGUE
CLAY	GANGUE
CHERT	GANGUE
DOLOMITE	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
COLLOPHANE	PHOSPHATES	VARIABLE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
CALCITE	CARBONATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: STRIPPING

## DESCRIPTION OF COVER:

100 PERCENT QUICKSAND

PERCENT WASTE ROCK: 71.4

## HARDNESS OF ORE:

QUICKSAND

SLOPE OF PIT: 65 DEGREES

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE

LATITUDE: N 35 46 14

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: TRUCK

DESTINATION FACILITY: MILL (OFF-SITE)

LATITUDE: N 35 47 20

LOCATION: USA TENNESSEE

LONGITUDE: W 87 16 56

DISTANCE (KM): 7.5

LOCATION: USA TENNESSEE

LONGITUDE: W 87 19 30

## BENEFICIATION:

METHOD: WASHING

## -----DESCRIPTION OF MILLING-----

ORE/SLUICED/SCREEN/CRUSH/WASH/

CLASSIFY/CLAY TO DISPOSAL

## TRANSPORTATION FOR PRODUCT: PHOSPHATE CONCENTRATE

ORIGINATING FACILITY: MILL (OFF-SITE) LOCATION: USA TENNESSEE

LATITUDE: N 35 47 20

LONGITUDE: W 87 19 30

PERCENT SHIPPED: 100

DESTINATION FACILITY: FOB MILL

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: MONSANTO PROPERTIES

SEQUENCE NUMBER: 0471190086

NATION: USA STATE: TENNESSEE

COUNTY: MAURY

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 35 DEG 40 MIN 00 SEC

LONGITUDE: W 87 DEG 07 MIN 00 SEC

UTM - ZONE: 16 HEMISPHERE: NORTHERN

NORTHING: 3946784 EASTING: 489440

POINT OF REFERENCE: PLANT

PRECISION: 100 METERS

ELEVATION: 180 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1979

TYPE OF MINERAL HOLDING

MINERALS ONLY; FEE OWNERSHIP;  
PRIVATE LEASE

## OWNERSHIP

## STATUS

MONSANTO INDUSTRIAL CHEMICALS COMPANY

OWNER-OPERATOR

FARMERS CONSTRUCTION COMPANY

OPERATOR

OTHER MINING CONTRACTORS

OPERATOR

## COMMODITY

## MODIFIER

## MARKETABILITY

PHOSPHATE

PHOSPHORUS

PRIMARY PRODUCT

FLUORINE

RECOVERABLE

IRON

FERRIC OXIDE

AFFECT MARKETABLITY

ALUMINUM

ALUMINA

AFFECT MARKETABLITY

CALCIUM

OXIDE

AFFECT MARKETABLITY

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

THE AGGREGATED 1978 RESERVE-RESOURCE TONNAGE FOR TENNESSEE IS 71.672 MILLION METRIC TONS OF ORE AT AN IN SITU GRADE OF 20.9% P205. THIS TOTAL TONNAGE INCLUDES THE IN SITU, IDENTIFIED RESERVES-RESOURCES OF THIS DEPOSIT.

SOURCE: ZELLARS-WILLIAMS INC. EVALUATION OF PHOSPHATE DEPOSITS OF TENNESSEE USING THE MINERALS AVAILABILITY SYSTEM. BUMINES OPEN FILE REPORT 13 - 79, 1978, 37 FP..

DEPOSIT CONSISTS OF 49 SMALL DEPOSITS IN GILES, HICKMAN, MARSHALL, MAURY, AND WILLIAMSON COUNTIES.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

ORE-MINERAL IN PLACE

AUGER

YEAR OF DISCOVERY: 1935

YEAR OF INITIAL PRODUCTION: 1937

### GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; REPLACEMENT; DISSEMINATED  
 MODE OF ORIGIN: RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: IRREGULAR; TABULAR  
 CONTROLLING FEATURES: BEDDING; LITHOLOGY

#### LITHOLOGY:

NAME OF FORMATION:	BIGBY-CANNON LIMESTONE	GEOLOGIC AGE:	MIDDLE ORDOVICIAN
ROCK TYPE:			
PHOSPHORITE	IS ORE		
LIMESTONE	LIES UNDER ORE		
SAND	CANGUE		
CLAY	GANGUE		

#### MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
COLLOPHANE	PHOSPHATES	VARIABLE
QUARTZ	FCRMS OF SiO <sub>2</sub>	VARIABLE
CALCITE	CARBONATES	VARIABLE
DOLOMITE	CARBONATES	VARIABLE

### MINE/MILL INFORMATION ORE FEED TO MONSANTO PLANT

#### SURFACE MINING:

METHOD: STRIPPING	HARDNESS OF ORE:
DESCRIPTION OF COVER:	QUICKSAND
100 PERCENT QUICKSAND	SLOPE OF PIT: 65 DEGREES
PERCENT WASTE ROCK: 68.0	

#### TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE	LOCATION: USA TENNESSEE
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: TRUCK	DISTANCE (KM): <51
METHOD OF TRANSPORTATION: RAIL	DISTANCE (KM): >51
DESTINATION FACILITY: MILL (OFF-SITE)	LOCATION: USA TENNESSEE
LATITUDE: N 35 40 00	LONGITUDE: W 87 07 00

#### BENEFICIATION:

METHOD: WASHING	-----DESCRIPTION OF MILLING-----
	ORE/WASH/SIZE

TRANSPORTATION FOR PRODUCT: PHOSPHATE CONCENTRATE	
ORIGINATING FACILITY: MILL (OFF-SITE)	LOCATION: WASHER-COLUMBIA
LATITUDE: N 35 40 00	LONGITUDE: W 87 07 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: CONVEYOR	DISTANCE (KM): 0.1
DESTINATION FACILITY: SMELTER(ON-SITE)	LOCATION: FURNACE-COLUMBIA
LATITUDE: N 35 40 00	LONGITUDE: W 87 07 00

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UTAHLOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: FLAMING GORGE

SEQUENCE NUMBER: 0490090003

NATION: USA STATE: UTAH

COUNTY: DAGGETT

TYPE OF OPERATION: PROSPECT

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 40 DEG 56 MIN 00 SEC

LONGITUDE: W 100 DEG 46 MIN 00 SEC

UTM - ZONE: 12 HEMISPHERE: NORTHERN

NORTHING: 4531876 EASTING: 603833

POINT OF REFERENCE: ORE BODY

PRECISION: 10 KILOMETERS

ELEVATION: 2130 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1980

TYPE OF MINERAL HOLDING

FEDERAL LEASE; STATE LEASE;  
FEE OWNERSHIP

ALTERNATE NAMES

SHEEP CREEK  
SULS CANYON  
HORSESHOE CANYON

OWNERSHIP

U.S. GOVERNMENT  
STATE OF UTAH  
VARIOUS PRIVATE OWNERS

STATUS

OWNER  
OWNER  
UNKNOWN

COMMODITY

PHOSPHATE  
URANIUM  
WATER CONTENT

MODIFIER

U3O8 CONTENT  
FREE WATER

MARKETABILITY

PRIMARY PRODUCT  
RECOVERABLEPUBLISHED RESERVE-RESOURCE INFORMATIONUNDIFFERENTIATED  
UNITS  
YEAR/DATARECORD 1  
97,100,000  
MT ORE  
1967RECORD 2  
76,100,000  
MT ORE  
1967RECORD 3  
260,400,000  
MT ORE  
1964UNCIFFERENTIATED  
UNITS  
YEAR/DATARECORD 4  
71,700,000  
MT ORE  
1954RECORD 5  
110,800,000  
MT ORE  
1939

IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	F205	18.0	WT-PCT
	H2O	0	WT-PCT
2	F205	24.0	WT-PCT
	H2O	0	WT-PCT
3	F205	18.0	WT-PCT
	H2O	0	WT-PCT
4	F205	24.0	WT-PCT
	H2O	0	WT-PCT
5	F205	22.9	WT-PCT
	H2O	0	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORDS 1, 2, 3, AND 4: GIVEN GRADE IS CUTOFF GRADE.

RECORDS 1 CONSIST OF RESOURCES BETWEEN HORSESHOE CANYON AND SHEEP CREEK ABOVE  
AND 2: ENTRY LEVEL.

RECORDS 3 CONSIST OF ALL RESOURCES IN THE FLAMING GORGE AREA ABOVE ENTRY  
AND 4: LEVEL.

RECORD 5: CONSISTS OF ALL RESOURCES IN THE FLAMING GORGE AREA WITHIN 1150  
FEET OF VERTICAL DEPTHS.

SOURCE FOR RECORDS 1 AND 2:

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SOURCE FOR RECORDS 3 AND 4:

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SOURCE FOR RECORD 5:

WILLIAMS, J. S. PHOSPHATE IN UTAH. UTAH AGR. EXPT. STA. BULL.  
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DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

ORE-MINERAL IN PLACE

-----EXPLORATION METHODS-----

GEOLOGICAL

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

**LITHOLOGY:**

NAME OF FORMATION: PARK CITY FORMATION      GEOLOGIC AGE: UPPER PERMIAN  
 DEFORMATION DESCRIPTION: FAULTING; MINOR FOLDING; MAJOR FAULTING  
 RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION  
 GEOLOGIC AGE: TERTIARY

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SHALE	NEAR ORE
CHERT	NEAR ORE
SANDSTONE	NEAR ORE
LIMESTONE	NEAR ORE
DOLOMITE	NEAR ORE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
APATITE	PHOSPHATES	APHANITIC
QUARTZ	FORMS OF SiO <sub>2</sub>	APHANITIC
ILLITE	SILICATES	APHANITIC
DOLOMITE	CARBONATES	APHANITIC
CALCITE	CARBONATES	APHANITIC
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	APHANITIC
FELDSPAR	SILICATES	APHANITIC
GYPSUM	SULFATES & CHROMATES	APHANITIC
FLUORITE	HALIDES	APHANITIC
ZIRCON	SILICATES	APHANITIC
TOURMALINE	SILICATES	APHANITIC
MONTMORILLONITE	SILICATES	APHANITIC
KAOLINITE	SILICATES	APHANITIC
SPHENE	SILICATES	APHANITIC
PYRITE	SULFIDES	APHANITIC

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RITZNA, H. R. GEOLOGIC ATLAS OF UTAH-DAGGETT COUNTY. UTAH GEOL. AND MINERALOG. SURVEY BULL. 66, 1959, 116 PP.

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: WESTERN UNTA RANGE

SEQUENCE NUMBER: 0490130008

NATION: USA STATE: UTAH

COUNTY: DUCHESNE

TYPE OF OPERATION: PROSPECT

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 40 DEG 31 MIN 00 SEC

LONGITUDE: W 111 DEG 06 MIN 00 SEC

UTM - ZONE: 12 HEMISPHERE: NORTHERN  
491528

NORTHING: 4484898 EASTING:

POINT OF REFERENCE: ORE BODY

PRECISION: 10 KILOMETERS

ELEVATION: 3000 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1980

TYPE OF MINERAL HOLDING

FEDERAL LEASE; FEE OWNERSHIP

## ALTERNATE NAMES

MACKENTIRE DRAW

WOLF CREEK

ROCK CREEK VALLEY

FRANSON CANYON

DRY CANYON

## OWNERSHIP

U.S. GOVERNMENT

## STATUS

OWNER

UINTAH AND OURAY INDIAN RESERVATION

OWNER

VARIGUS PRIVATE OWNERS

UNKNOWN

## COMMODITY

## MODIFIER

## MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

URANIUM

U308 CONTENT

RECOVERABLE

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

## UNDIFFERENTIATED

## RECORD 1

## RECORD 2

## UNITS

276,700,000

179,600,000

## YEAR/DATA

MT ORE

MT ORE

1967

1967

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	11.0	WT-PCT
	H2O	0	WT-PCT
2	P205	18.0	WT-PCT
	H2O	0	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORDS 1: GIVEN GRADES ARE CUTOFF GRADES.  
AND 2

RECORD 1: CONSISTS OF RESOURCES OVER THE NORTH FLANK OF THE UNITA MOUNTAINS.

RECORD 2: CONSISTS OF RESOURCES OVER THE SOUTH FLANK OF THE UNITA MOUNTAINS.

SOURCE FOR RECORDS 1 AND 2:

COFFMAN, J. S., AND A. L. SERVICE. AN EVALUATION OF THE WESTERN  
PHOSPHATE INDUSTRY AND ITS RESOURCES - PART 4, WYOMING AND UTAH.  
BUREAU OF MINES RI 6934, 1967, 158 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

ORE-MINERAL IN PLACE

YEAR OF DISCOVERY: 1914

-----EXPLORATION METHODS-----

GEOLOGICAL

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSITS

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

LITHOLOGY:

NAME OF FORMATION: PARK CITY FORMATION

GEOLOGIC AGE:

UPPER PERMIAN

DEFORMATION DESCRIPTION: FAULTING; MINOR FOLDING; MAJOR FAULTING

RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

GEOLOGIC AGE: TERTIARY

ROCK TYPE:

PHOSPHORITE IS CRE

SHALE NEAR ORE

CHERT NEAR ORE

SANDSTONE NEAR ORE

LIMESTONE NEAR ORE

UNLOMITE NEAR ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
APATITE	PHOSPHATES	APHANITIC
QUARTZ	FORMS OF SiO <sub>2</sub>	APHANITIC
ILLITE	SILICATES	APHANITIC
DOLomite	CARBONATES	APHANITIC
CALCITE	CARBONATES	APHANITIC
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	APHANITIC
FELDSPAR	SILICATES	APHANITIC
GYPSUM	SULFATES & CHROMATES	APHANITIC
FLUORITE	HALIDES	APHANITIC
ZIRCON	SILICATES	APHANITIC
TOURMALINE	SILICATES	APHANITIC
MONTMORILLONITE	SILICATES	APHANITIC
KAOLINITE	SILICATES	APHANITIC
SPHENE	SILICATES	APHANITIC
PYRITE	SULFIDES	APHANITIC

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CLABAUGH, P. S. PERMIAN PHOSPHATE DEPOSITS OF MONTANA, IDAHO, WYOMING, AND UTAH. U.S. GEOL. SURVEY STRATEGIC MINER. INV. PRELIM. MAP 3-198, 1946, 1 SHEET.

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DE VOTO, R. H., AND D. N. STEVENS, EDS. URANIFEROUS PHOSPHATE RESOURCES AND TECHNOLOGY AND ECONOMICS OF URANIUM RECOVERY FROM PHOSPHATE RESOURCES, UNITED STATES AND FREE WORLD. SUBCONTRACT 78-177-S TO DEPT. OF ENERGY CONTRACT 50-54-5903 (BENDIX FIELD ENG. CORP.) BY EARTH SCIENCES INC., 1979, 1396 PP. PLUS PLATES.

DUNCAN, W. E., AND H. G. FISK. CENTRAL WYOMING PHOSPHATE ROCK - CHARACTER, PROCESSING, AND ECONOMICS. UNIV. OF WYO. NAT. RES. RESEARCH INST. BULL. 6, 1957, 60 PP.

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RULE, A. R., D. E. KIRBY, AND D. C. DAHLIN. RECENT ADVANCES IN BENEFICIATION OF WESTERN PHOSPHATES. PRES. AT SME FALL MEETING AND EXHIBIT, ST. LOUIS, MO., OCT. 19-21, 1977, 17 PP.

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U.S. BUREAU OF LAND MANAGEMENT. STATE OF UTAH LAND OWNERSHIP AND PUBLIC MANAGEMENT, WASATCH - F. U.S. BUR. LAND MANAGEMENT MAP, 1:250,000-SCALE, 1973, 1 SHEET.

U.S. BUREAU OF LAND MANAGEMENT. STATE OF WYOMING LAND STATUS. U.S. BUR. OF LAND MANAGEMENT MAP, 1:500,000 SCALE, 1978, 1 SHEET.

WILLIAMS, J. S. PHOSPHATE IN UTAH. UTAH AGR. EXPT. STA. BULL. 290, 1942, 44 PP.

WILLIAMS, J. S. THE PERMIAN SYSTEM IN THE UNTA 1-DEGREE BY 2-DEGREE TOPOGRAPHIC MAP. U.S. GEOL. SURVEY 1:250,000-SCALE MAP, 1969, 1 SHEET.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: CRAWFORD MOUNTAINS

SEQUENCE NUMBER: 0490330008

NATION: USA STATE: UTAH

COUNTY: RICH  
CURRENT STATUS: PAST PRODUCER  
LONGITUDE: W 111 DEG 06 MIN 00 SEC  
LATITUDE: N 41 DEG 38 MIN 00 SEC  
NORTHING: 4608858 EASTING: 491670  
PRECISION: 10 KILOMETERS  
PRECISION: 100 METERS  
YEAR OF INFORMATION: 1980TYPE OF OPERATION: SURFACE-UNDERGROUND  
LATITUDE: N 41 DEG 38 MIN 00 SEC  
UTM - ZONE: 12 HEMISPHERE: NORTHERN  
POINT OF REFERENCE: ORE BODY  
ELEVATION: 1920 METERS  
DATUM: SEA LEVELTYPE OF MINERAL HOLDING:  
PATENTED CLAIM; FEDERAL LEASE;  
STATE LEASE

## ALTERNATE NAMES

ARICKAREE MINE  
CHEROKEE MINE  
PAPNEE MINE  
MANDAN MINEEMMA MINE  
TUSCARORA MINE  
REX PEAK MINE  
BRADLEY MINESIOUX MINE  
PEARL MINE  
CRAWFORD GROUP

## OWNERSHIP

U.S. GOVERNMENT  
STAUFFER CHEMICAL COMPANY  
VARIOUS PRIVATE OWNERS

## STATUS

OWNER  
OWNER  
UNKNOWN

## COMMODITY

PHOSPHATE  
URANIUM  
LATER CONTENT

## MODIFIER

U3O8 CONTENT  
FREE WATERMARKETABILITY  
PRIMARY PRODUCT  
RECOVERABLEPUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3
UNDIFFERENTIATED	197,000,000	111,000,000	29,700,000
UNITS	MT ORE	MT ORE	MT ORE
YEAR/DATA	1967	1967	1967

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	F205	18.0	WT-PCT
	H20	0	WT-PCT
2	F205	24.0	WT-PCT
	H20	0	WT-PCT
3	P205	31.0	WT-PCT
	H20	0	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORDS 1, GIVEN GRADE IS CUTOFF GRADE.  
2, AND 3:

SOURCE FOR RECORDS 1, 2, AND 3:

COFFMAN, J. S., AND A. L. SERVICE. AN EVALUATION OF THE WESTERN PHOSPHATE INDUSTRY AND ITS RESOURCES - PART 4, WYOMING AND UTAH. BUMINES RI 6934, 1967, 158 PP.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:	-----EXPLORATION METHODS-----
ORE-MINERAL IN PLACE	GEOLOGICAL
YEAR OF DISCOVERY: 1904	
YEAR OF INITIAL PRODUCTION: 1907	
YEAR OF FINAL PRODUCTION: 1975	

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
SHAPE OF ORE BODY: TABULAR  
CONTROLLING FEATURES: LITHOLOGY  
DEGREE OF WALL ROCK ALTERATION: NONE

TYPE OF ORE BODY: SEDIMENTARY  
MODE OF ORIGIN: SEDIMENTATION  
SHAPE OF ORE BODY: TABULAR  
CONTROLLING FEATURES: LITHOLOGY  
DEGREE OF WALL ROCK ALTERATION: NONE

LITHOLOGY:	
NAME OF FORMATION: PHOSPHORIA FORMATION	GEOLOGIC AGE:
UPPER PERMIAN	
DEFORMATION DESCRIPTION: FAULTING; MINOR FOLDING; MAJOR FAULTING	
RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION	
GEOLOGIC AGE: TERTIARY	
ROCK TYPE:	
PHOSPHORITE	IS ORE
MUDSTONE	NEAR ORE
CHERT	NEAR ORE
LIMESTONE	NEAR ORE
DOLOMITE	NEAR ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
ARAGONITE	PHOSPHATES	APHANITIC
QUARTZ	FORMS OF SiO <sub>2</sub>	APHANITIC
ILLITE	SILICATES	APHANITIC
DOLOMITE	CARBONATES	APHANITIC
CALCITE	CARBONATES	APHANITIC
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	APHANITIC
FELDSPAR	SILICATES	APHANITIC
GYPSUM	SULFATES & CHROMATES	APHANITIC
FLUORITE	HALIDES	APHANITIC
ZIRCON	SILICATES	APHANITIC
TOURMALINE	SILICATES	APHANITIC
MONTMORILLONITE	SILICATES	APHANITIC
KAOLOWITE	SILICATES	APHANITIC
SPHENE	SILICATES	APHANITIC
FYRITE	SULFIDES	APHANITIC

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DE VOTO, R. H., AND D. N. STEVENS, EDS. URANIIFEROUS PHOSPHATE RESOURCES AND TECHNOLOGY AND ECONOMICS OF URANIUM RECOVERY FROM PHOSPHATE RESOURCES, UNITED STATES AND FREE WORLD. SUBCONTRACT 78-177-S TO DEPT. OF ENERGY CONTRACT FG-54-5903 (BENDIX FIELD ENG. CORP.) BY EARTH SCIENCES INC., 1979, 1396 PP. PLUS PLATES.

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GALE, H. S., AND R. W. RICHARDS. PHOSPHATES. IN U.S. GEOL. SURVEY BULL. 430, 1910, PP. 457-553.

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GULBRANDSEN, R. A. SOME COMPOSITIONAL FEATURES OF PHOSPHORITES OF THE PHOSPHORIA FORMATION. IN INTERMOUNTAIN ASSOC. OF GEOL. 15TH ANN. FIELD CONF., 1967, PP. 95-102.

HALE, L. A., ED. ANATOMY OF THE WESTERN PHOSPHATE FIELD. INTERMOUNTAIN ASSOC. OF GEOL. 15TH ANN. FIELD CONF., 1967, 287 PP., 3 PLATES.

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SMITH, L. E., E. G. HOSFORD, R. S. SEARS, D. P. SPROUSE, AND M. D. STEWART. STRATIGRAPHIC SECTIONS OF THE PHOSPHORIA FORMATION IN UTAH, 1947-48. U.S. GEOL. SURVEY CIRC. 211, 1952, 30 PP.

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U.S. BUREAU OF LAND MANAGEMENT. STATE OF UTAH LAND OWNERSHIP AND PUBLIC MANAGEMENT, BEAR LAKE - C. U.S. BUR. LAND MANAGEMENT MAP, 1:250,000 SCALE, 1978, 1 SHEET.

U.S. BUREAU OF LAND MANAGEMENT. STATE OF WYOMING LAND STATUS. U.S. BUR. OF LAND MANAGEMENT MAP, 1:500,000 SCALE, 1978, 1 SHEET.

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: NORTHERN WASATCH RANGE

SEQUENCE NUMBER: 0490330009

NATION: USA STATE: UTAH

COUNTY: RICH

TYPE OF OPERATION: PROSPECT

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 41 DEG 28 MIN 00 SEC

LONGITUDE: W 111 DEG 22 MIN 00 SEC

UTM - ZONE: 12 HEMISPHERE: NORTHERN

NORTHING: 4590415 EASTING: 469380

POINT OF REFERENCE: ORE BODY

PRECISION: 10 KILOMETERS

ELEVATION: 2045 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1980

TYPE OF MINERAL HOLDING

MINERALS ONLY; FEE OWNERSHIP

ALTERNATE NAMES

DRY BREAD HOLLOW  
WOODRUFF CREEK

OWNERSHIP

U.S. GOVERNMENT

STATUS

VARIOUS PRIVATE OWNERS

OWNER

UNKNOWN

COMMODITY

MODIFIER

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

URANIUM

U308 CONTENT

RECOVERABLE

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3
UNDIFFERENTIATED UNITS	3,200,000	5,100,000	2,300,000
YEAR/DATA	MT ORE	MT ORE	MT ORE
	RECORD 4	RECORD 5	RECORD 6
UNDIFFERENTIATED UNITS	41,000,000	25,900,000	453,600,000
YEAR/DATA	MT ORE	MT ORE	MT ORE
	1964	1964	1969

IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	18.0	WT-PCT
	H2O	0	WT-PCT
2	P205	24.0	WT-PCT
	H2O	0	WT-PCT
3	P205	31.0	WT-PCT
	H2O	0	WT-PCT
4	P205	18.0	WT-PCT
	H2O	0	WT-PCT
5	P205	24.0	WT-PCT
	H2O	0	WT-PCT
6	P205	18.0	WT-PCT
	H2O	0	WT-PCT

## RESERVE-RESOURCE - REMARKS

ALL RECORDS: GIVEN GRADES ARE CUTOFF GRADES.

RECORD 1: CONSISTS OF RESOURCES IN LAKETOWN CANYON PER 100 FEET OF VERTICAL DEPTH.

RECORDS 2 CONSISTS OF RESOURCES AT WOODRUFF CRREK AND LAKETOWN CANYON PER AND 3: 100 FEET OF DEPTH.

RECORDS 4 CONSIST OF RESOURCES AT DRY BREAD HOLLOW.

AND 5:

RECORD 6: CONSIST OF RESOURCES SOUTH OF DRY BREAD HOLLOW UNDER TERTIARY COVER.

SOURCE FOR RECORDS 1, 2, AND 3:

COFFMAN, J. S., AND A. L. SERVICE. AN EVALUATION OF THE WESTERN PHOSPHATE INDUSTRY AND ITS RESOURCES - PART 4, WYOMING AND UTAH. BUMINES RI 6934, 1967, 158 PP.

SOURCE FOR RECORDS 4 AND 5:

SCHELL, E. M. PRELIMINARY REPORT ON THE PHOSPHATE DEPOSITS AND STRATIGRAPHY OF PERMIAN ROCKS IN DRY BREAD HOLLOW, HEBER COUNTY, UTAH. U.S. GEOL. SURVEY OPEN FILE REPT. 64-138, 1964, 38 PP., PLATE.

SOURCE FOR RECORD 6:

MULLENS, T. E. GEOLOGIC MAP OF THE CAUSEY DAM QUADRANGLE, WEBER COUNTY, UTAH. U.S. GEOL. SURVEY GEOL. SURVEY GEOL. QUADRANGLE MAP GG-790, 1969.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

ORE-MINERAL IN PLACE

YEAR OF DISCOVERY: 1889

EXPLORATION METHODS-----

GEOLOGICAL

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

## LITHOLOGY:

NAME OF FORMATION: PARK CITY FORMATION      GEOLOGIC AGE: UPPER PERMIAN  
 DEFORMATION DESCRIPTION: FAULTING; MINOR FOLDING; MAJOR FAULTING  
 RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION  
 GEOLOGIC AGE: TERTIARY

## ROCK TYPE:

PHOSPHORITE	IS ORE
SHALE	NEAR ORE
CHERT	NEAR ORE
SANDSTONE	NEAR ORE
LIMESTONE	NEAR ORE
DOLOMITE	NEAR ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
APATITE	PHOSPHATES	APHANITIC
QUARTZ	FORMS OF SiO <sub>2</sub>	APHANITIC
ILLITE	SILICATES	APHANITIC
DOLOMITE	CARBONATES	APHANITIC
CALCITE	CARBONATES	APHANITIC
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	APHANITIC
FELDSPAR	SILICATES	APHANITIC
GYPSUM	SULFATES & CHROMATES	APHANITIC
FLUORITE	HALIDES	APHANITIC
ZIRCON	SILICATES	APHANITIC
TOURMALINE	SILICATES	APHANITIC
MONTMORILLONITE	SILICATES	APHANITIC
KAOLINITE	SILICATES	APHANITIC
SPHENE	SILICATES	APHANITIC
PYRITE	SULFIDES	APHANITIC

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CHENEY, T. M., R. A. SMART, R. G. WARING, AND M. A. WARNER. STRATIGRAPHIC SECTIONS OF THE PHOSPHORIA FORMATION IN UTAH, 1949-51. U.S. GEOL. SURVEY CIRC. 306, 1953, 40 PP.

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DE VITO, R. H., AND D. N. STEVENS, EDs. URANIFEROUS PHOSPHATE RESOURCES AND TECHNOLOGY AND ECONOMICS OF URANIUM RECOVERY FROM PHOSPHATE RESOURCES, UNITED STATES AND FREE WORLD. SUBCONTRACT 78-177-S TO DEPT. OF ENERGY CONTRACT EO-54-5903 (DENDIX FIELD ENG. CORP.) BY EARTH SCIENCES INC., 1974, 1340 PP. PLUS PLATES.

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RULE, A. R., D. E. KIRBY, AND D. C. DAHLIN. RECENT ADVANCES IN BENEFICIATION OF WESTERN PHOSPHATES. PRES. AT SME FALL MEETING AND EXHIBIT, ST. LOUIS, MO., OCT. 19-21, 1977, 17 PP.

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SCHUMACHER, O. L., R. A. PENSE, AND R. B. DAVIS. FEDERAL LAND STATUS IN THE OVERTHRUST BELT OF IDAHO, MONTANA, UTAH, AND WYOMING, 1979. BUMINES SPECIAL REPT. (IN PRESS), TEXT WITH MAPS AND OVERLAYS, 1979.

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WILLIAMS, J. S., AND A. M. HANSON. THE PHOSPHATE RESERVES OF UTAH. UTAH AGR. EXPT. STA. BULL. 304, 1942, 23 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: CENTRAL WASATCH RANGE

SEQUENCE NUMBER: 0490350098

NATION: USA STATE: UTAH

COUNTY: SALT LAKE

TYPE OF OPERATION: PROSPECT

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 40 DEG 39 MIN 00 SEC

LONGITUDE: W 111 DEG 34 MIN 00 SEC

UTM - ZONE: 12 HEMISPHERE: NORTHERN

NORTHING: 4499847 EASTING: 452089

POINT OF REFERENCE: C.R.E. UCDY

PRECISION: 10 KILOMETERS

ELEVATION: 2165 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1980

## TYPE OF MINERAL HOLDING

FEE OWNERSHIP

## OWNERSHIP

U.S. GOVERNMENT

## STATUS

OWNER

STATE OF UTAH

OWNER

VARIOUS PRIVATE OWNERS

UNKNOWN

## COMMODITY

## MODIFIER

## MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

URANIUM

RECOVERABLE

WATER CONTENT

U308 CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3	RECORD 4
UNDIFFERENTIATED UNITS	18,300,000	8,100,000	16,400,000	11,300,000
YEAR/DATA	MT ORE 1942	MT ORE 1942	MT ORE 1967	MT ORE 1967

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	32.6	WT-PCT
	H2O	0	WT-PCT
2	P205	32.6	WT-PCT
	H2O	0	WT-PCT
3	P205	18.0	WT-PCT
	H2O	0	WT-PCT
4	P205	24.0	WT-PCT
	H2O	0	WT-PCT

## RESERVE-RESOURCE - REMARKS

- RECORD 1: CONSISTS OF RESOURCES WITHIN 1500 FEET OF VERTICAL DEPTH IN THE MILL CREEK - BIG COTTONWOOD CANYON TREND.
- RECORD 2: CONSISTS OF RESOURCES WITHIN 1500 FEET OF VERTICAL DEPTH OVER 2 OUTCROPS IN THE SOUTHERN PART OF THE HEBER CITY - PARK CITY VICINITY.
- RECORDS 3 AND 4: CONSISTS OF ABOVE ENTR LEVEL RESOURCES IN THE EMMIGRANT CANYON TREND. GIVEN GRADES ARE CUTOFF GRADES.

## SOURCE FOR RECORDS 1 AND 2:

WILLIAMS, J. S., AND A.M. HANSON THE PHOSPHATE RESERVES OF UTAH.  
UTAH AGR. EXPT. STA. BULL. 304, 1942, 23 PP.

## SOURCE FOR RECORDS 3 AND 4:

COFFMAN, J. S., AND A. L. SERVICE. AN EVALUATION OF THE WESTERN  
PHOSPHATE INDUSTRY AND ITS RESOURCES - PART 4, WYOMING AND UTAH.  
BUMINES RI 6934, 1967, 158 PP.

DEPOSIT\_HISTORICAL\_INFORMATION

## DISCOVERY METHOD:

ORE-MINERAL IN PLACE

## -----EXPLORATION METHODS-----

GEOLOGICAL

GEOLOGIC\_AND\_SPATIAL\_CHARACTERISTICS\_OF\_DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

## LITHOLOGY:

NAME OF FORMATION: PARK CITY FORMATION GEOLOGIC AGE: UPPER PERMIAN

DEFORMATION DESCRIPTION: FAULTING; MINOR FOLDING; MAJOR FAULTING

RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

GEOLOGIC AGE: TERTIARY

## ROCK TYPE:

PHOSPHORITE	IS ORE
SHALE	NEAR ORE
CHERT	NEAR ORE
SANDSTONE	NEAR ORE
LIMESTONE	NEAR ORE
DOLomite	NEAR ORE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
APATITE	PHOSPHATES	APHANITIC
QUARTZ	FORMS OF SiO <sub>2</sub>	APHANITIC
ILLITE	SILICATES	APHANITIC
DOLOMITE	CARBONATES	APHANITIC
CALCITE	CARBONATES	APHANITIC
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	APHANITIC
FELDSPAR	SILICATES	APHANITIC
GYPSUM	SULFATES & CHROMATES	APHANITIC
FLUORITE	HALIDES	APHANITIC
ZIRCON	SILICATES	APHANITIC
TOURMALINE	SILICATES	APHANITIC
MONTMURILLONITE	SILICATES	APHANITIC
KACLINITE	SILICATES	APHANITIC
SPHENE	SILICATES	APHANITIC
FYRITE	SULFIDES	APHANITIC

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BAKER, A. A., F. C. CALKINS, M. D. CRITTENDEN, JR., AND C. S. BROMFIELD. GEOLOGIC MAP OF THE BRIGHTON QUADRANGLE, UTAH. U.S. GEOL. SURVEY GEOL. QUADRANGLE MAP GQ-534, 1966.

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BROMFIELD, C. S., AND M. D. CRITTENDEN, JR. GEOLOGIC MAP OF THE PARK CITY EAST QUADRANGLE, SUMMIT AND WASATCH COUNTIES, UTAH. U.S. GEOL. SURVEY GEOL. QUADRANGLE MAP GG-852, 1971.

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U.S. BUREAU OF LAND MANAGEMENT. STATE OF UTAH LAND OWNERSHIP AND PUBLIC MANAGEMENT, WASATCH - F. U.S. BUR. LAND MANAGEMENT MAP, 1:250,000 SCALE, 1973, 1 SHEET.

U.S. BUREAU OF LAND MANAGEMENT. STATE OF UTAH LAND OWNERSHIP AND PUBLIC MANAGEMENT, BEAR LAKE - C. U.S. BUR. LAND MANAGEMENT MAP, 1:250,000 SCALE, 1978, 1 SHEET.

U.S. GEOLOGICAL SURVEY. OGDEN, UTAH; WYOMING, 1-DEGREE BY 2-DEGREE TOPOGRAPHIC MAP. U.S. GEOL. SURVEY, 1:250,000-SCALE MAP, 1954, 1 SHEET.

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WILLIAMS, J. S., AND A. M. HANSON. THE PHOSPHATE RESERVES OF UTAH. UTAH AGR. EXPT. STA. BULL. 304, 1942, 23 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: VERNAL MINE

SEQUENCE NUMBER: 0490470028

NATION: USA STATE: UTAH

COUNTY: UNTAH

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 40 DEG 36 MIN 05 SEC

LONGITUDE: W 109 DEG 29 MIN 25 SEC

UTM - ZONE: 12 HEMISPHERE: NORTHERN

NORTHING: 4495393 EASTING: 627737

POINT OF REFERENCE: PLANT

PRECISION: 100 METERS

ELEVATION: 1829 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING

PATENTED CLAIMS

OWNERSHIP

CHEVRON

STATUS

OWNER-OPERATOR

COMMODITY

MODIFIER

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

URANIUM

U308 CONTENT

RECOVERABLE

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

UNDIFFERENTIATED

RECORD 1

RECORD 2

RECORD 3

UNITS

454,000,000

635,000,000

640,000,000

YEAR/DATA

MT ORE

MT ORE

MT ORE

1967

1966

1966

IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	16	WT-PCT
2	P205	18	WT-PCT
3	P205	20	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORD 1: 16 PERCENT P205 IS CUTOFF GRADE.

RECORD 2: 18 PERCENT P205 IS CUTOFF GRADE.

SOURCE FOR RECORD 1:

COFFMAN, J. S., AND A. L. SERVICE. AN EVALUATION OF THE WESTERN PHOSPHATE INDUSTRY AND ITS RESOURCES - PART 4, WYOMING AND UTAH. BUMINES RI 6934, 1967, 158 PP.

SOURCE FOR RECORD 2:

SERVICE, A. L. HISTORY &amp; DEVELOPMENT OF THE PHOSPHATE INDUSTRY AND ITS RESOURCE, PART 4, WYOMING &amp; UTAH. IN INTERMOUNTAIN ASSOC. OF GEOL. 15TH ANN. FIELD CONF., 1967, PP. 173-185.

SOURCE FOR RECORD 3:

BEALL, J. V., AND P. C. MERRITT. PHOSPHATE AND POTASH--MINERALS TO FEED THE WORLD. MIN. ENG., OCTOBER 1966, PP. 75-99.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

ORE-MINERAL IN PLACE

YEAR OF DISCOVERY: 1915

YEAR OF INITIAL PRODUCTION: 1961

## -----EXPLORATION METHODS-----

GEOLOGICAL

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDING; FOLDING

DEGREE OF WALL ROCK ALTERATION: NONE

## MINERALIZED ZONE:

AVERAGE DEPTH: 15 METERS

MINIMUM DEPTH: 0 METERS

AVERAGE LENGTH: 15000 METERS

STRIKE/DIP: S70W/07S

AVERAGE WIDTH: 4000 METERS

AVERAGE THICKNESS: 6.1 METERS

## UNCONSOLIDATED MATERIAL:

AVERAGE THICKNESS: 1 METER

MINIMUM THICKNESS: 0 METER

## LITHOLOGY:

NAME OF FORMATION: PARK CITY FORMATION

GEOLOGIC AGE: UPPER PERMIAN

DEFORMATION DESCRIPTION: MINOR FOLDING

RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

GEOLOGIC AGE: BEFORE CRETACEOUS

ROCK TYPE:

PHOSPHORITE IS ORE

## MINERALIZATION:

MINERAL NAME

MINERAL CLASS

COLLOPHANE

PHOSPHATES

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: STRIPPING

HARDNESS OF ORE:

DESCRIPTION OF COVER:

MEDIUM-HARD ROCKS

MEDIUM-HARD ROCKS

AVERAGE COVER THICKNESS: 15 METERS

SURFACE AREA OF MINE: 5990

HECTARES

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE

LOCATION: VERNAL MINE

LATITUDE: N 40 36 05

LONGITUDE: W 109 29 25

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: TRUCK

LOCATION: VERNAL MILL

DESTINATION FACILITY: MILL (ON-SITE)

LONGITUDE: W 109 29 25

LATITUDE: N 40 36 05

## BENEFICIATION:

METHOD: FLotation

----- DESCRIPTION OF MILLING -----  
ORE CRUSHED/DESLIMED/P205 FLOAT

TRANSPORTATION FOR PRODUCT: ACID GRADE P205  
ORIGINATING FACILITY: MILL (ON-SITE)  
LATITUDE: N 40 36 05  
PERCENT SHIPPED: 100  
METHOD OF TRANSPORTATION: TRUCK; RAIL  
DESTINATION FACILITY: REFINERY

LOCATION: VERNAL MILL  
LONGITUDE: W 109 29 25

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GERE, W. C. PHOSPHATE. IN MINERAL AND WATER RESOURCES OF UTAH. UTAH GEOL. AND MINERALOG. SURVEY BULL. 73, 1964, PP. 195-205.

KING, D. L., JR. SAN FRANCISCO PHOSPHATE DEPOSIT IN THE UNTA BASIN. IN INTERMOUNTAIN ASSOC. OF PETROLEUM GEOL. 13TH ANN. FIELD CONF., 1964, PP. 259-263.

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KINNEY, D. M. GEOLOGY OF THE UNTA RIVER AND BRUSH CREEK-DIAMOND MOUNTAIN AREAS, DUCHESNE AND UNTAH COUNTIES, UTAH. U.S. GEOL. SURVEY OIL AND GAS INV. MAP OM-123, 1957.

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SCHULTZ, A. R. A GEOLOGIC RECONNAISSANCE OF THE UNTA MOUNTAINS, NORTHERN UTAH, WITH SPECIAL REFERENCE TO PHOSPHATE. IN CONTRIBUTIONS TO ECON. GEOL., 1918, PART I, U.S. GEOL. SURVEY BULL. 690, 1919, PP. 31-94, PLATE.

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SERVICE, A.L. HISTORY & DEVELOPMENT OF THE PHOSPHATE INDUSTRY IN SOUTHEASTERN IDAHO. IN INTERMOUNTAIN ASSOC. OF GEOL. 15TH ANN. FIELD CONF., 1967, PP. 173-185.

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UNTERMANN, G. E., B. R. UNTERMANN, AND D. M. KINNEY. GEOLOGY OF UNTAH COUNTY. UTAH GEOL. AND MINERALOG. SURVEY BULL. 72, 1964, 2 PLATES.

U.S. GEOLOGICAL SURVEY. VERNAL, UTAH; COLORADO, 1-DEGREE BY 2-DEGREE TOPOGRAPHIC MAP. U.S. GEOL. SURVEY, 1:250,000-SCALE MAP, 1954, 1 SHEET.

U.S. BUREAU OF LAND MANAGEMENT. STATE OF UTAH LAND OWNERSHIP AND PUBLIC MANAGEMENT, BASIN - H., U.S. EUR. LAND MANAGEMENT MAP, 1:250,000 SCALE, 1973, 1 SHEET.

WILLIAMS, J. S. PHOSPHATE IN UTAH. UTAH AGR. EXPT. STA. BULL. 290, 1942, 44 PP.

WILLIAMS, J. S. THE PERMIAN SYSTEM IN THE UNTA MOUNTAIN AREA. IN INTERMOUNTAIN ASSOC. OF GEOL. 16TH ANN. FIELD CONF. GUIDEBOOK, 1969, PP. 153-168.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: VERNAL FIELD

SEQUENCE NUMBER: 0490470057

NATION: USA STATE: UTAH

COUNTY: UNTAH

TYPE OF OPERATION: PROSPECT

CURRENT STATUS: EXPLORERED DEPOSIT

LATITUDE: N 40 DEG 35 MIN 00 SEC

LONGITUDE: W 109 DEG 36 MIN 00 SEC

UTM - ZONE: 12 HEMISPHERE: NORTHERN

NORTHING: 4493235 EASTING: 618485

POINT OF REFERENCE: ORE BODY

PRECISION: 10 KILOMETERS

ELEVATION: 2130 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1980

TYPE OF MINERAL HOLDING

FEE OWNERSHIP; MINERALS ONLY

## ALTERNATE NAMES

BRUSH CREEK

ASHLEY CREEK

LITTLE BRUSH CREEK

DRY FORK

ROCK CREEK CANYON

LITTLE DIAMOND MOUNTIAN

SPLIT MOUNTIAN

## OWNERSHIP

U.S. GOVERNMENT

## STATUS

OWNER

UNIDENTIFIED OWNER

OWNER

STATE OF UTAH

OWNER

## COMMODITY

## MODIFIER

## MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

URANIUM

U3O8 CONTENT

RECOVERABLE

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

## UNDIFFERENTIATED

## RECORD 1

111,900,000

## RECORD 2

209,600,000

## RECORD 3

70,100,000

## RECORD 4

829,300,000

## UNITS

MT ORE

MT ORE

MT ORE

MT ORE

## YEAR/DATA

1955

1955

1955

1967

## UNDIFFERENTIATED

## RECORD 5

751,800,000

## RECORD 6

119,800,000

## RECORD 7

7,500,000

## RECORD 8

1,524,000,000

## UNITS

MT ORE

MT ORE

MT ORE

MT ORE

## YEAR/DATA

1967

1967

1939

1939

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	20.0	WT-PCT
	H20	0	WT-PCT
2	P205	20.0	WT-PCT
	H20	0	WT-PCT
3	P205	20.0	WT-PCT
	H20	0	WT-PCT
4	P205	16.0	WT-PCT
	H20	0	WT-PCT
F	P205	18.0	WT-PCT
	H20	0	WT-PCT
F	P205	16.0	WT-PCT
	H20	0	WT-PCT
7	P205	20.2	WT-PCT
	H20	0	WT-PCT
8	P205	18.3	WT-PCT
	H20	0	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORDS 1, GIVEN GRADES ARE AVERAGED FOR ALL OUTCROPS EAST OF ASHLEY CREEK.

2, AND 3:

RECORDS 4, GIVEN GRADES ARE CUTOFF GRADES.

5, AND 6:

RECORD 1: CONTAINS RESOURCES ABOVE STREAM LEVEL IN T2S R23E EAST OF LITTLE BRUSH

CREEK.

RECORD 2: CONTAINS RESOURCES ABOVE STREAM LEVEL EAST OF ASHLEY CREEK IN T3S R21E.

RECORD 3: CONTAINS RESOURCES ABOVE STREAM LEVEL WEST OF ASHLEY CREEK IN T3S R20E.

RECORD 4: CONTAINS ABOVE DRAINAGE LEVEL RESOURCES BETWEEN ASHLEY CREEK AND BRUSH

CREEK, INCLUDING PART OF THE VERNAL MINE AREA.

RECORD 5: CONTAINS ABOVE DRAINAGE LEVEL RESOURCES BETWEEN BRUSH CREEK AND LITTLE

DIAMOND MOUNTAIN.

RECORD 6: CONSISTS OF RESOURCES OVER ALL OUTCROPS WEST OF THE DIVIDE BETWEEN ASHLEY CREEK AND DRY FORK.

RECORD 7: CONSISTS OF RESOURCES WITHIN 1250 FEET OF VERTICAL DEPTH OVER A 3-MILE

OUTCROP ACROSS WHITEROCKS RIVER.

RECORD 8: CONSISTS OF RESOURCES OVER THE ENTIRE OUTCROP AREA EAST OF DRY FORK,

INCLUDING THE VERNAL MINE AREA.

## SOURCE FOR RECORDS 1, 2, AND 3:

KINNEY, D.M. GEOLOGY OF THE UNTA RIVER, BRUSH CREEK AREA,  
DUCHESNE AND UNTAH COUNTIES, UTAH. U.S. GEOL. SURVEY BULL. 1007,  
1955, 185 PP., PLATES.

## SOURCE FOR RECORDS 4, 5, AND 6:

COFFMAN, J. S., AND A. L. SERVICE. AN EVALUATION OF THE WESTERN  
PHOSPHATE INDUSTRY AND ITS RESOURCES - PART 4, WYOMING AND UTAH.  
BUMINES RI 6934, 1967, 158 PP.

## SOURCE FOR RECORDS 7 AND 8:

WILLIAMS, J. S. PHOSPHATE IN UTAH. UTAH AGR. EXPT. STA. BULL.  
290, 1939, 44 PP.

DEPOSIT\_HISTORICAL\_INFORMATION

## DISCOVERY METHOD:

ORE-MINERAL IN PLACE

## -----EXPLORATION METHODS-----

GEOLOGICAL

## YEAR OF DISCOVERY: 1914

GEOLOGIC\_AND\_SPATIAL\_CHARACTERISTICS\_OF\_DEPOSIT

## TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

## SHAPE OF ORE BODY: TABULAR

## CONTROLLING FEATURES: LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

## TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

## SHAPE OF ORE BODY: TABULAR

## CONTROLLING FEATURES: LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

## LITHOLOGY:

NAME OF FORMATION: PARK CITY FORMATION      GEOLOGIC AGE: UPPER PERMIAN

DEFORMATION DESCRIPTION: FAULTING; MINOR FOLDING; MAJOR FAULTING

RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

GELOGIC AGE: TERTIARY

## ROCK TYPE:

PHOSPHORITE	IS ORE
SHALE	NEAR ORE
CHERT	NEAR ORE
SANDSTONE	NEAR ORE
LIMESTONE	NEAR ORE
DOLOMITE	NEAR ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
APATITE	PHOSPHATES	APHANITIC
QUARTZ	FORMS OF SiO <sub>2</sub>	APHANITIC
ILLITE	SILICATES	APHANITIC
DOLOMITE	CARBONATES	APHANITIC
CALCITE	CARBONATES	APHANITIC
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	APHANITIC
FELDSPAR	SILICATES	APHANITIC
GYPSUM	SULFATES & CHROMATES	APHANITIC
FLUORITE	HALIDES	APHANITIC
ZIRCON	SILICATES	APHANITIC
TOURMALINE	SILICATES	APHANITIC
MONTMORILLONITE	SILICATES	APHANITIC
KAOLINITE	SILICATES	APHANITIC
SELENITE	SILICATES	APHANITIC
PYRITE	SULFIDES	APHANITIC

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DE VITO, R. H., AND D. N. STEVENS, EDs. URANIFEROUS PHOSPHATE RESOURCES AND TECHNOLOGY AND ECONOMICS OF URANIUM RECOVERY FROM PHOSPHATE RESOURCES, UNITED STATES AND FREE WORLD. SUBCONTRACT 78-177-S TO DEPT. OF ENERGY CONTRACT 50-54-5903 (ENDIX FIELD ENG. CORP.) BY EARTH SCIENCES INC., 1979, 1396 PP. PLUS PLATES.

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SCHUMACHER, O. L., R. A. PENSE, AND R. B. DAVIS. FEDERAL LAND STATUS IN THE OVERTHRUST BELT OF IDAHO, MONTANA, UTAH, AND WYOMING, 1979. BUMINES SPECIAL REPT. (IN PRESS), TEXT WITH MAPS AND OVERLAYS, 1979.

U.S. BUREAU OF LAND MANAGEMENT. STATE OF UTAH LAND OWNERSHIP AND PUBLIC MANAGEMENT, BASIN - H. U.S. EUR. LAND MANAGEMENT MAP, 1:250,000 SCALE, 1973, 1 SHEET.

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WILLIAMS, J. S. THE PERMIAN SYSTEM IN THE UNTA MOUNTAIN AREA. IN INTERMOUNTAIN ASSOC. OF GEOL. 16TH ANN. FIELD CONF. GUIDEBOOK, 1969, PP. 153-168.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SOUTHERN WASATCH RANGE      SEQUENCE NUMBER: 0490490073

NATION: USA	STATE: UTAH	COUNTY: UTAH
TYPE OF OPERATION: PROSPECT		CURRENT STATUS: PAST PRODUCER
LATITUDE: N 40 DEG 10 MIN 00 SEC		LONGITUDE: W 111 DEG 26 MIN 00 SEC
UTM - ZONE: 12	HEMISPHERE: NORTHERN	NORTHING: 4446135 EASTING: 463099
POINT OF REFERENCE: ORE BODY		PRECISION: 10 KILOMETERS
ELEVATION: 1830 METERS		PRECISION: 100 METERS
DATUM: SEA LEVEL		YEAR OF INFORMATION: 1980

TYPE OF MINERAL HOLDING  
FEDERAL LEASE; FEE OWNERSHIPALTERNATE NAMES  
LITTLE DIAMOND CREEK

OWNERSHIP	STATUS
UNIDENTIFIED OWNER	OWNER
U.S. GOVERNMENT	OWNER
VARIOUS PRIVATE OWNERS	UNKNOWN

COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
URANIUM	U308 CONTENT	RECOVERABLE
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3
UNDIFFERENTIATED	1,200,000	4,500,000	4,500,000
UNITS	MT ORE	MT ORE	MT ORE
YEAR/DATA	1939	1967	1967

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	25.2	WT-PCT
	H2O	0	WT-PCT
2	P205	18.0	WT-PCT
	H2O	0	WT-PCT
3	P205	24.0	WT-PCT
	H2O	0	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORD 1: RESOURCES TO DEPTH OF 2500 FEET.  
 RECORDS 2 CONSISTS OF RESOURCES WITHIN 2500 FEET OF VERTICAL DEPTH AND OVER  
 AND 3: 1300 FEET OF OUTCROP IN THE VICINITY OF LITTLE DIAMOND CREEK.  
 GIVEN GRADES ARE CUTOFF GRADES.

## SOURCE FOR RECORD 1:

WILLIAMS, J. S. PHOSPHATE IN UTAH. UTAH AGR. EXPT. STA. BULL. 290, 1939, 44 PP.

## SOURCE FOR RECORDS 2 AND 3:

COFFMAN, J. S., AND A. L. SERVICE. AN EVALUATION OF THE WESTERN PHOSPHATE INDUSTRY AND ITS RESOURCES - PART 4, WYOMING AND UTAH. BUREAUS RI 6934, 1967, 158 PP.

DEPOSIT\_HISTORICAL INFORMATION

## DISCOVERY METHOD:

ORE-MINERAL IN PLACE

## -----EXPLORATION METHODS-----

GEOLOGICAL

YEAR OF INITIAL PRODUCTION: 1941

YEAR OF FINAL PRODUCTION: 1953

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

## LITHOLOGY:

NAME OF FORMATION: PARK CITY FORMATION GEOLOGIC AGE: UPPER PERMIAN

DEFORMATION DESCRIPTION: FAULTING; MINOR FOLDING; MAJOR FAULTING

RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

GEOLOGIC AGE: TERTIARY

## ROCK TYPE:

PHOSPHORITE

IS ORE

SHALE

NEAR ORE

CHERT

NEAR ORE

SANDSTONE

NEAR ORE

LIMESTONE

NEAR ORE

DOLOMITE

NEAR ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
APATITE	PHOSPHATES	APHANITIC
QUARTZ	FORMS OF SiO <sub>2</sub>	APHANITIC
ILLITE	SILICATES	APHANITIC
DOLomite	CARBONATES	APHANITIC
CALCITE	CARBONATES	APHANITIC
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	APHANITIC
FELDSPAR	SILICATES	APHANITIC
GYPSUM	SULFATES & CHROMATES	APHANITIC
FLUORITE	HALIDES	APHANITIC
ZIRCON	SILICATES	APHANITIC
TOURMALINE	SILICATES	APHANITIC
MONTMORILLONITE	SILICATES	APHANITIC
KAOLINITE	SILICATES	APHANITIC
SPHENE	SILICATES	APHANITIC
PYRITE	SULFIDES	APHANITIC

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## WYOMING

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SOUTHEAST WIND RIVER RANGE SEQUENCE NUMBER: 0560130879

NATION: USA STATE: WYOMING

COUNTY: FREMONT

TYPE OF OPERATION: PROSPECT

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 42 DEG 40 MIN 00 SEC

LONGITUDE: W 108 DEG 45 MIN 00 SEC

UTM - ZONE: 13 HEMISPHERE: NORTHERN

NORTHING: 4726039 EASTING: 684391

POINT OF REFERENCE: ORE BODY

PRECISION: 10 KILOMETERS

ELEVATION: 2640 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1980

## TYPE OF MINERAL HOLDING

FEE OWNERSHIP: MINERALS ONLY;

FEDERAL LEASE: STATE LEASE

## ALTERNATE NAMES

BALEWIN CREEK - CHERRY CREEK

RED CANYON

TWIN CREEK - TWEED CREEK

TWEED CREEK-BEAVER CREEK

SWEETWATER RIVER

## OWNERSHIP

U.S. GOVERNMENT

## STATUS

OWNER

STATE OF WYOMING

OWNER

WIND RIVER INDIAN RESERVATION

OWNER

## COMMODITY

## MODIFIER

## MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

URANIUM

U3O8 CONTENT

RECOVERABLE

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3
INFERRED UNITS YEAR/DATA	\$4,600,000 MT ORE 1963	236,300,000 MT ORE 1963	125,700,000 MT ORE 1963
UNDIFFERENTIATED UNITS YEAR/DATA	RECORD 4 \$4,900,000 MT ORE 1947	RECORD 5 14,500,000 MT ORE 1947	RECORD 6 20,200,000 MT ORE 1967
UNDIFFERENTIATED UNITS YEAR/DATA	RECORD 7 18,400,000 MT ORE 1967	RECORD 8 13,900,000 MT ORE 1967	RECORD 9 22,700,000 MT ORE 1967

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	18.0	WT-PCT
	H20	0	WT-PCT
2	P205	18.0	WT-PCT
	H20	0	WT-PCT
3	P205	18.0	WT-PCT
	H20	0	WT-PCT
4	P205	18.0	WT-PCT
	H20	0	WT-PCT
5	P205	24.0	WT-PCT
	H20	0	WT-PCT
6	P205	18.0	WT-PCT
	H20	0	WT-PCT
7	P205	18.0	WT-PCT
	H20	0	WT-PCT
8	P205	18.0	WT-PCT
	H20	0	WT-PCT
9	P205	18.0	WT-PCT
	H20	0	WT-PCT

## RESERVE-RESOURCE - REMARKS

ALL RECORDS: GIVEN GRADES ARE CUTOFF GRADES.

- RECORD 1: CONTAINS ABOVE ENTRY LEVEL RESOURCES IN THE MIDDLE POPO AGIE RIVER AND BALDWIN CREEK AREAS.
- RECORD 2: CONTAINS ABOVE ENTRY LEVEL RESOURCES IN THE WILLOW CREEK AREA PLUS ADJACENT AREA NORTH OF CHERRY CREEK.
- RECORD 3: INCLUDES ABOVE ENTRY LEVEL RESOURCES IN THE DEEP CREEK, TWEED CREEK, AND BEAVER CREEK AREAS, PLUS THE SOUTHERN TWO-THIRDS OF THE CHERRY CREEK AREA.
- RECORDS 4 AND 5: CONSIST OF ABOVE ENTRY LEVEL RESOURCES IN THE AREA FROM CHERRY CREEK TO BALDWIN CREEK (INCLUDES THE MIDDLE POPO AGIE RIVER AND WILLOW CREEK AREAS).
- RECORD 6: CONTAINS ABOVE ENTRY LEVEL RESOURCES IN THE MACFIE BLOCK AREA BETWEEN CHERRY CREEK AND LITTLE POPO AGIE RIVER.
- RECORD 7: CONTAINS ABOVE ENTRY LEVEL RESOURCES BETWEEN TWIN CREEK AND TWEED CREEK.
- RECORD 8: CONSISTS OF ABOVE DRAINAGE LEVEL RESOURCES BETWEEN TWEED CREEK AND BEAVER CREEK.
- RECORD 9: CONSISTS OF ABOVE DRAINAGE LEVEL RESOURCES IN THE SWEETWATER RIVER AREA.

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SOURCE FOR RECORDS 4 AND 5:

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#### DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

ORE-MINERAL IN PLACE

-----EXPLORATION METHODS-----

GEOLOGICAL

#### GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

#### LITHOLOGY:

NAME OF FORMATION: PARK CITY FORMATION      GEOLOGIC AGE: UPPER PERMIAN

DEFORMATION DESCRIPTION: FAULTING; MINOR FOLDING; MAJOR FAULTING

RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

    GEOLOGIC AGE: TERTIARY

#### ROCK TYPE:

PHOSPHORITE	IS ORE
SHALE	NEAR ORE
CHERT	NEAR ORE
SANDSTONE	NEAR ORE
LIMESTONE	NEAR ORE
UDOLMITE	NEAR ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
AFATITE	PHOSPHATES	APHANITIC
QUARTZ	FORMS OF SiO <sub>2</sub>	APHANITIC
ILLITE	SILICATES	APHANITIC
DOLOMITE	CARBONATES	APHANITIC
CALCITE	CARBONATES	APHANITIC
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	APHANITIC
FELDSPAR	SILICATES	APHANITIC
GYPSUM	SULFATES & CHROMATES	APHANITIC
FLUORITE	HALIDES	APHANITIC
ZIRCON	SILICATES	APHANITIC
TOURMALINE	SILICATES	APHANITIC
MONTMORILLONITE	SILICATES	APHANITIC
KAGLINITE	SILICATES	APHANITIC
SPHENE	SILICATES	APHANITIC
PYRITE	SULFIDES	APHANITIC

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SNAKE RIVER RANGE

SEQUENCE NUMBER: 0560230029

NATION: USA STATE: WYOMING

COUNTY: LINCOLN  
CURRENT STATUS: EXPLORED DEPOSIT  
LONGITUDE: W 110 DEG 58 MIN 00 SEC  
NORTHING: 4810573 EASTING: 502697  
PRECISION: 10 KILOMETERS  
PRECISION: 100 METERS  
YEAR OF INFORMATION: 1980

TYPE OF OPERATION: PROSPECT

LATITUDE: N 43 DEG 27 MIN 00 SEC

UTM - ZONE: 12 HEMISPHERE: NORTHERN

POINT OF REFERENCE: UTM EOD

ELEVATION: 2440 METERS

DATUM: SEA LEVEL

## TYPE OF MINERAL HOLDING:

FEE OWNERSHIP

## ALTERNATE NAMES

BIG HOLE MOUNTAINS

SOUTHERN SNAKE RIVER RANGE

NORTHEASTERN SNAKE RIVER RANGE

SOUTHERN TETON RANGE

NORTHWESTERN SNAKE RIVER RANGE

## OWNERSHIP

U.S. GOVERNMENT

## STATUS

OWNER

## COMMODITY

PHOSPHATE

## MODIFIED

## MARKETABILITY

PRIMARY PRODUCT

URANIUM

URGE CONTENT

RECOVERABLE

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

INFERRED	RECORD 1	RECORD 2	RECORD 3
UNDIFFERENTIATED	312,800,000	-----	-----
UNITS	MT ORE	MT ORE	MT ORE
YEAR/DATA	1963	1972	1972

RECORD 4	RECORD 5	RECORD 6
77,400,000	-----	6,900,000
MT ORE	MT ORE	MT ORE
1963	1973	1963

INFERRED	RECORD 4	RECORD 5	RECORD 6
UNDIFFERENTIATED	77,400,000	-----	6,900,000
UNITS	MT ORE	MT ORE	MT ORE
YEAR/DATA	1963	1973	1963

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	18.0	WT-PCT
	H2O	0	WT-PCT
2	P205	18.0	WT-PCT
	H2O	0	WT-PCT
3	P205	18.0	WT-PCT
	H2O	0	WT-PCT
4	P205	24.0	WT-PCT
	H2O	0	WT-PCT
5	P205	24.0	WT-PCT
	H2O	0	WT-PCT
6	P205	31.0	WT-PCT
	H2O	0	WT-PCT

## RESERVE-RESOURCE - REMARKS .

ALL RECORDS: GIVEN GRADES ARE CUTOFF GRADES.

RECORD 1: INCLUDES RESOURCES IN THE IDAHO PORTION OF THE TETON RANGE, AND ON THE IDAHO SIDE OF THE NORTHWEST TREND SOUTH OF TETON PASS; EXCLUDES RESOURCES IN THE WYOMING PORTION OF ONE IDAHO-WYOMING BLOCK IN THE NORTHWEST SNAKE RIVER RANGE.

RECORDS 2 CONSIST OF RESOURCES IN THE RENDEZVOUS PEAK QUADRANGLE ONLY.  
AND 5:

RECORD 3: CONSISTS OF RESOURCES IN THE FERRY PEAK QUADRANGLE ONLY.

RECORD 4: INCLUDES RESOURCES IN THE IDAHO PORTION OF THE TETON RANGE, AND ON THE IDAHO SIDE OF THE NORTHWEST TREND SOUTH OF TETON PASS.

RECORD 6: INCLUDES RESOURCES IN THE IDAHO PORTION OF THE TETON RANGE.

## SOURCE FOR RECORDS 1, 4, AND 6:

SHELDON, R. P. PHYSICAL STRATIGRAPHY AND MINERAL RESOURCES OF PERMAIAN ROCKS IN WESTERN WYOMING. U.S. GEOL. SURVEY PROF. PAPER 313-B, 1963, PP.49-273, PLATES.

## SOURCE FOR RECORDS 2 AND 5:

SCHROEDER, M. L. GEOLOGIC MAP OF RENDEZVOUS PEAK QUADRANGLE, TETON COUNTY, WYOMING. U.S. GEOL. SURVEY GEOL. QUADRANGLE MAP GQ-980, 1972, 1973.

## SOURCE FOR RECORD 3:

JOBIN, D. A. GEOLOGIC MAP OF THE FERRY PEAK QUADRANGLE, LINCOLN COUNTY, WYOMING. U.S. GEOL. SURVEY GEOL. QUADRANGLE MAP GQ-1027, 1972.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

ORE-MINERAL IN PLACE

## -----EXPLORATION METHODS-----

GEOLOGICAL

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: TABULAR  
 CONTROLLING FEATURES: LITHOLOGY  
 DEGREE OF WALL ROCK ALTERATION: NONE

TYPE OF ORE BODY: SEDIMENTARY  
 MODE OF ORIGIN: SEDIMENTATION  
 SHAPE OF ORE BODY: TABULAR  
 CONTROLLING FEATURES: LITHOLOGY  
 DEGREE OF WALL ROCK ALTERATION: NONE

## LITHOLOGY:

NAME OF FORMATION: PHOSPHORIA FORMATION GEOLOGIC AGE: UPPER PERMIAN  
 DEFORMATION DESCRIPTION: FAULTING; MINOR FOLDING; MAJOR FAULTING  
 RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION  
 GEOLOGIC AGE: TERTIARY

## ROCK TYPE:

PHOSPHORITE	IS ORE
MUDSTONE	NEAR ORE
CHEM	NEAR ORE
LIMESTONE	NEAR ORE
DOLOMITE	NEAR ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
APATITE	PHOSPHATES	APHANITIC
QUARTZ	FORMS OF SiO <sub>2</sub>	APHANITIC
ILLITE	SILICATES	APHANITIC
DOLOMITE	CARBONATES	APHANITIC
CALCITE	CARBONATES	APHANITIC
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	APHANITIC
FELDSPAR	SILICATES	APHANITIC
GYPSUM	SULFATES & CHROMATES	APHANITIC
FLUORITE	HALIDES	APHANITIC
ZIRCON	SILICATES	APHANITIC
TOURMALINE	SILICATES	APHANITIC
MONTMORILLONITE	SILICATES	APHANITIC
KAOLOWITE	SILICATES	APHANITIC
SPHENE	SILICATES	APHANITIC
PYRITE	SULFIDES	APHANITIC

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LOCATION AND GENERAL DEPOSIT INFORMATION

OFFCIT NAME: SALT RIVER RANGE

SEQUENCE NUMBER: 0560230030

NATION: USA STATE: WYOMING

COUNTY: LINCOLN

TYPE OF OPERATION: PROSPECT

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 42 DEG 43 MIN 00 SEC

LONGITUDE: W 110 DEG 49 MIN 00 SEC

UTM - ZONE: 12 HEMISPHERE: NORTHERN

NORTHING: 4729153 EASTING: 515012

POINT OF REFERENCE: ORE BODY

PRECISION: 10 KILOMETERS

ELEVATION: 2740 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1980

## TYPE OF MINERAL HOLDING

LOCATED CLAIM; FEE OWNERSHIP

## ALTERNATE NAMES

STRAWBERRY CREEK - WILLOW CREEK

SWIFT CREEK - COTTONWOOD CREEK

SOUTHERN SALT RIVER RANGE

## OWNERSHIP

U.S. GOVERNMENT

## STATUS

AMERICAN NUCLEAR CORPORATION

OWNER

UNKNOWN

## COMMODITY

## MODIFIER

## MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

URANIUM

U3O8 CONTENT

RECOVERABLE

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3
UNDIFFERENTIATED	353,900,000	273,500,000	10,900,000
UNITS	MT ORE	MT ORE	MT ORE
YEAR/DATA	1967	1967	1967

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	18.0	WT-PCT
	H2O	0	WT-PCT
2	P205	24.0	WT-PCT
	H2O	0	WT-PCT
3	P205	31.0	WT-PCT
	H2O	0	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORDS 1, 2, AND 3: GIVEN GRADES ARE CUTOFF GRADES.

## SOURCE FOR RECORDS 1, 2, AND 3:

CORFMAN, J. S., AND A. L. SERVICE. AN EVALUATION OF THE WESTERN PHOSPHATE INDUSTRY AND ITS RESOURCES - PART 4, WYOMING AND UTAH. BUMINES RI 6934, 1967, 158 PP.

DEPOSIT\_HISTORICAL\_INFORMATION

DISCOVERY METHOD:  
ORE-MINERAL IN PLACE

-----EXPLORATION METHODS-----  
GEOLOGICAL

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
SHAPE OF ORE BODY: TABULAR  
CONTROLLING FEATURES: LITHOLOGY  
DEGREE OF WALL ROCK ALTERATION: NONE

TYPE OF CRE BODY: SEDIMENTARY  
MODE OF ORIGIN: SEDIMENTATION  
SHAPE OF CRE BODY: TABULAR  
CONTROLLING FFATURES: LITHOLOGY  
DEGREE OF WALL ROCK ALTERATION: NONE

## LITHOLOGY:

NAME OF FORMATION: PHOSPHORIA FORMATION      GEOLOGIC AGE: UPPER PERMIAN  
DEFORMATION DESCRIPTION: FAULTING; MINOR FOLDING; MAJOR FAULTING  
RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION  
GEOLOGIC AGE: TERTIARY

## ROCK TYPE:

PHOSPHORITE	IS ORE
MUDSTONE	NEAR ORE
CHERT	NEAR ORE
LIMESTONE	NEAR ORE
DOLOMITE	NEAR ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
APATITE	PHOSPHATES	APHANITIC
QUARTZ	FORMS OF SiO <sub>2</sub>	APHANITIC
ILLITE	SILICATES	APHANITIC
DOLomite	CARBONATES	APHANITIC
CALCITE	CARBONATES	APHANITIC
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	APHANITIC
FELDSPAR	SILICATES	APHANITIC
GYPSUM	SULFATES & CHROMATES	APHANITIC
FLUORITE	HALIDES	APHANITIC
ZIRCON	SILICATES	APHANITIC
TOURMALINE	SILICATES	APHANITIC
MONTMORILLONITE	SILICATES	APHANITIC
KACLINITE	SILICATES	APHANITIC
SPHENE	SILICATES	APHANITIC
PYRITE	SULFIDES	APHANITIC

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U.S. GEOLOGICAL SURVEY. DRIGGS, IDAHO; WYOMING 1-DEGREE BY 2-DEGREE TOPOGRAPHIC MAP. U.S. GEOL. SURVEY, 1:250,000-SCALE MAP, 1955, 1 SHEET.

U.S. GEOLOGICAL SURVEY. MINERAL AND WATER RESOURCES OF WYOMING. U.S. CONGRESS - SENATE DOC. 76, 1970, PP. 14-15, 145-147.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME:	WYOMING RANGE	SEQUENCE NUMBER:	0560230032
NATION:	USA	STATE:	WYOMING
TYPE OF OPERATION:	FROSPECT	COUNTY:	LINCOLN
LATITUDE:	N 42 DEG 44 MIN 00 SEC	CURRENT STATUS:	EXPLORED DEPOSIT
UTM - ZONE:	12	LONGITUDE:	W 110 DEG 36 MIN 00 SEC
POINT OF REFERENCE:	ORE BODY	NORTHING:	4731065
ELEVATION:	3050 METERS	EASTING:	532744
DATUM:	SEA LEVEL	PRECISION:	10 KILOMETERS
		PRECISION:	100 METERS
		YEAR OF INFORMATION:	1980

TYPE OF MINERAL HOLDING  
FEE OWNERSHIP

OWNERSHIP	STATUS	
U.S. GOVERNMENT	OWNER	
COMMODITY	MODIFIER	MARKETABILITY
PHOSPHATE		PRIMARY PRODUCT
URANIUM	U308 CONTENT	RECOVERABLE
WATER CONTENT	FREE WATER	

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3	RECORD 4
INFERRRED	201,700,000	399,500,000	-----	-----
UNDIFFERENTIATED	-----	-----	452,700,000	144,200,000
UNITS	MT ORE	MT ORE	MT ORE	MT ORE
YEAR/DATA	1954	1954	1967	1967

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	18.0	WT-PCT
	H2O	0	WT-PCT
2	P205	24.0	WT-PCT
	H2O	0	WT-PCT
3	P205	18.0	WT-PCT
	H2O	0	WT-PCT
4	P205	24.0	WT-PCT
	H2O	0	WT-PCT

## RESERVE-RESOURCE - REMARKS

ALL RECORDS: GIVEN GRADES ARE CUTOFF GRADES.

## SOURCE FOR RECORDS 1 AND 2:

SHELDON, R. P., E. R. CRESSMAN, L. D. CARSWELL, AND R. A. SMART.  
 STRATIGRAPHIC SECTIONS OF THE PHOSPHORIA FORMATION IN WYOMING,  
 1952.

U.S. GEOL. SURVEY CIRC. 325, 1954, 24 PP.

## SOURCE FOR RECORDS 3 AND 4:

COFFMAN, J. S., AND A. L. SERVICE. AN EVALUATION OF THE WESTERN  
 PHOSPHATE INDUSTRY AND ITS RESOURCES - PART 4, WYOMING AND UTAH.  
 BUREAU OF MINE REPT. 6934, 1967, 158 PP.

DEPOSIT\_HISTORICAL\_INFORMATION

DISCOVERY METHOD:  
ORE-MINERAL IN PLACE

-----EXPLORATION METHODS-----  
GEOLOGICAL

GEOLOGIC\_AND\_SPATIAL\_CHARACTERISTICS\_OF\_DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
SHAPE OF ORE BODY: TABULAR  
CONTROLLING FEATURES: LITHOLOGY  
DEGREE OF WALL ROCK ALTERATION: NONE

TYPE OF ORE BODY: SEDIMENTARY  
MODE OF ORIGIN: SEDIMENTATION  
SHAPE OF ORE BODY: TABULAR  
CONTROLLING FEATURES: LITHOLOGY  
DEGREE OF WALL ROCK ALTERATION: NONE

## LITHOLOGY:

NAME OF FORMATION: PHOSPHORIA FORMATION      GEOLOGIC AGE: UPPER PERMIAN  
DEFORMATION DESCRIPTION: FAULTING; MINOR FOLDING; MAJOR FAULTING  
RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION  
GEOLOGIC AGE: TERTIARY

## ROCK TYPE:

PHOSPHORITE	IS ORE
MUDSTONE	NEAR ORE
CHERT	NEAR ORE
LIMESTONE	NEAR ORE
CALCITE	NEAR ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
AFATITE	PHOSPHATES	APHANITIC
QUARTZ	FORMS OF SiO <sub>2</sub>	APHANITIC
ILLITE	SILICATES	APHANITIC
DOLOMITE	CARBONATES	APHANITIC
CALCITE	CARBONATES	APHANITIC
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	APHANITIC
FELDSPAR	SILICATES	APHANITIC
GYPSUM	SULFATES & CHROMATES	APHANITIC
FLUORITE	HALIDES	APHANITIC
ZIRCON	SILICATES	APHANITIC
TOURMALINE	SILICATES	APHANITIC
MONTMORILLONITE	SILICATES	APHANITIC
KAOLOWITE	SILICATES	APHANITIC
SRHENE	SILICATES	APHANITIC
EYRITTE	SULFIDES	APHANITIC

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COFFMAN, J. S., AND A. L. SERVICE. AN EVALUATION OF THE WESTERN PHOSPHATE INDUSTRY AND ITS RESOURCES - PART 4, WYOMING AND UTAH. BUMINES RI 6934, 1967, 158 PP.

DAMES AND MOORE, INC. INVENTORY AND MARKET ANALYSIS OF THE PHOSPHATE RESOURCES OF UTAH. U.S. BUR. OF LAND MANAGEMENT CONTRACT STUDY (JOB NO. 08699-C11 - DAMES AND MOORE), 1978, 86 PP.

DE VOTE, R. H., AND D. N. STEVENS, ED. URANIIFEROUS PHOSPHATE RESOURCES AND TECHNOLOGY AND ECONOMICS OF URANIUM RECOVERY FROM PHOSPHATE RESOURCES, UNITED STATES AND FREE WORLD. SUBCONTRACT 78-177-S TO DEPT. OF ENERGY CONTRACT 50-54-5903 (BENDIX FIELD ENG. CORP.) BY EARTH SCIENCES INC., 1979, 1396 PP. PLUS PLATES.

DUNCAN, W. E., AND H. G. FISK. CENTRAL WYOMING PHOSPHATE ROCK - CHARACTER, PROCESSING, AND ECONOMICS. UNIV. OF WYO. NAT. RES. RESEARCH INST. BULL. 6, 1957, 60 PP.

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U.S. BUREAU OF LAND MANAGEMENT. STATE OF WYOMING LAND STATUS. U.S. BUR. OF LAND MANAGEMENT MAP, 1:500,000-SCALE, 1978, 1 SHEET.

U.S. GEOLOGICAL SURVEY. PRESTON, IDAHO; WYOMING, 1-DEGREE BY 2-DEGREE TOPOGRAPHIC MAP. U.S. GEOL. SURVEY, 1:250,000-SCALE MAP, 1955, 1-SHEET.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: TUMP RANGE

SEQUENCE NUMBER: 0560230034

NATION: USA STATE: WYOMING

COUNTY: LINCOLN

TYPE OF OPERATION: PROSPECT

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 42 DEG 06 MIN 00 SEC

LONGITUDE: W 110 DEG 49 MIN 00 SEC

UTM - ZONE: 12 HEMISPHERE: NORTHERN

NORTHING: 4660681 EASTING: 515159

POINT OF REFERENCE: ORE BODY

PRECISION: 10 KILOMETERS

ELEVATION: 2560 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1980

TYPE OF MINERAL HOLDING

FEE OWNERSHIP; MINERALS ONLY

ALTERNATE NAMES

TUMP RANGE

## OWNERSHIP

U.S. GOVERNMENT  
STATE OF WYOMING

## STATUS

OWNER  
OWNER

## COMMODITY

## MODIFIER

## MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

URANIUM

U3O8 CONTENT

RECOVERABLE

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3
UNDIFFERENTIATED UNITS YEAR/DATA	10,900,000 MT ORE 1967	8,300,000 MT ORE 1967	2,400,000 MT ORE 1967
	RECORD 4	RECORD 5	RECORD 6
UNDIFFERENTIATED UNITS YEAR/DATA	32,800,000 MT ORE 1967	21,800,000 MT ORE 1967	9,300,000 MT ORE 1967

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	18.0	WT-PCT
	H2O	0	WT-PCT
2	P205	24.0	WT-PCT
	H2O	0	WT-PCT
3	P205	31.0	WT-PCT
	H2O	0	WT-PCT
4	P205	18.0	WT-PCT
	H2O	0	WT-PCT
E	P205	24.0	WT-PCT
	H2O	0	WT-PCT
E	P205	31.0	WT-PCT
	H2O	0	WT-PCT

RESERVE-RESOURCE - REMARKS

ALL RECORDS: GIVEN GRADES ARE CUTOFF GRADES.

RECORDS 1, RECORDS CONSIST OF ABOVE ENTRY LEVEL RESOURCES IN THE BASIN CREEK  
2, AND 3: AREA.

RECORDS 4, RECORDS CONSIST OF ABOVE ENTRY LEVEL RESOURCES IN THE PINE  
5, AND 6: CREEK AND SULFUTTE CREEK DRAINAGES.

SOURCE FOR RECORDS 1, 2, 3, 4, 5, AND 6:

COFFMAN, J. S., AND A. L. SERVICE. AN EVALUATION OF THE WESTERN  
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UTAH.

BUREAU RI 6934, 1967, 158 PP.

DEPOSIT HISTORICAL INFORMATION

RECOVERY METHOD:

ORE-MINERAL IN PLACE

-----EXPLORATION METHODS-----  
GEOLOGICAL

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

LITHOLOGY:

NAME OF FORMATION: PHOSPHORIA FORMATION GEOLOGIC AGE: UPPER PERMIAN

DEFORMATION: DESCRIPTION: FAULTING; MINOR FOLDING; MAJOR FAULTING

RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

GEOLGIC AGE: TERTIARY

ROCK TYPE:

PHOSPHORITE	IS ORE
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MUDSTONE	NEAR ORE
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CHEAT	NEAR ORE
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LIMESTONE	NEAR ORE
-----------	----------

SOLOMITE	NEAR ORE
----------	----------

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
APATITE	PHOSPHATES	APHANITIC
QUARTZ	FORMS OF SiO <sub>2</sub>	APHANITIC
ILLITE	SILICATES	APHANITIC
DOLOMITE	CARBONATES	APHANITIC
CALCITE	CARBONATES	APHANITIC
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	APHANITIC
FELDSPAR	SILICATES	APHANITIC
GYPSUM	SULFATES & CHROMATES	APHANITIC
FLUORITE	HALIDES	APHANITIC
ZIRCON	SILICATES	APHANITIC
TOURMALINE	SILICATES	APHANITIC
MONTMORILLONITE	SILICATES	APHANITIC
KAOLINITE	SILICATES	APHANITIC
SPHENE	SILICATES	APHANITIC
PYRITE	SULFIDES	APHANITIC

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: BECKWITH HILLS

SEQUENCE NUMBER: 0560230035

NATION: USA STATE: WYOMING

COUNTY: LINCOLN

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PAST PRODUCER

LATITUDE: N 41 DEG 49 MIN 00 SEC

LONGITUDE: W 111 DEG 02 MIN 00 SEC

UTM - ZONE: 12 HEMISPHERE: NORTHERN

NORTHING: 4627358 EASTING: 497230

POINT OF REFERENCE: ORE BODY

PRECISION: 10 KILOMETERS

ELEVATION: 1980 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1980

TYPE OF MINERAL HOLDING

PATENTED CLAIM; FEDERAL LEASE;

FEE OWNERSHIP

ALTERNATE NAMES

LEEFE MINE

## OWNERSHIP

STAUFFER CHEMICAL COMPANY

## STATUS

OWNER

U.S. GOVERNMENT

OWNER

STATE OF WYOMING

OWNER

## COMMODITY

## MODIFIER

## MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

URANIUM

U3O8 CONTENT

RECOVERABLE

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

## -----EXPLORATION METHODS-----

ORE-MINERAL IN PLACE

GEOLOGICAL

YEAR OF DISCOVERY: 1905

YEAR OF INITIAL PRODUCTION: 1908

YEAR OF FINAL PRODUCTION: 1978

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

**LITHOLOGY:**

NAME OF FORMATION: PHOSPHORIA FORMATION      GEOLOGIC AGE: UPPER PERMIAN  
 DEFORMATION DESCRIPTION: FAULTING; MINOR FOLDING; MAJOR FAULTING  
 RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION  
 GEOLOGIC AGE: TERTIARY

**ROCK TYPE:**

PHOSPHORITE	IS ORE
MUDSTONE	NEAR ORE
CHERT	NEAR ORE
LIMESTONE	NEAR ORE
DOLOMITE	NEAR ORE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
APATITE	PHOSPHATES	APHANITIC
QUARTZ	FCRMS OF SiO <sub>2</sub>	APHANITIC
ILLITE	SILICATES	APHANITIC
DOLOMITE	CARBONATES	APHANITIC
CALCITE	CARBONATES	APHANITIC
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	APHANITIC
FELDSPAR	SILICATES	APHANITIC
GYPSUM	SULFATES & CHROMATES	APHANITIC
FLUORITE	HALIDES	APHANITIC
ZIRCON	SILICATES	APHANITIC
TUJMANLINE	SILICATES	APHANITIC
MONTMORILLONITE	SILICATES	APHANITIC
KAOLINITE	SILICATES	APHANITIC
SPHENE	SILICATES	APHANITIC
PYRITE	SULFIDES	APHANITIC

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SOUTH RIDGES

SEQUENCE NUMBER: 0560230101

NATION: USA STATE: WYOMING  
 TYPE OF OPERATION: SURFACE-UNDERGROUND  
 LATITUDE: N 42 DEG 13 MIN 00 SEC  
 UTM - ZONE: 12 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: CRE BODY  
 ELEVATION: 2440 METERS  
 DATUM: SEA LEVEL

COUNTY: LINCOLN  
 CURRENT STATUS: PAST PRODUCER  
 LONGITUDE: W 110 DEG 36 MIN 00 SEC  
 NORTHING: 4673696 EASTING: 533015  
 PRECISION: 10 KILOMETERS  
 PRECISION: 100 METERS  
 YEAR OF INFORMATION: 1980

TYPE OF MINERAL HOLDING  
 FEE OWNERSHIP

## ALTERNATE NAMES

TOP OF THE WORLD MINE  
 COMMISSARY RIDGE  
 SOUTH MOUNTAIN MINE  
 AESARUKA RICGE

## OWNERSHIP

U.S. GOVERNMENT  
 STATE OF WYOMING

## STATUS

OWNER  
 OWNER

## COMMODITY

PHOSPHATE  
 URANIUM  
 WATER CONTENT

## MODIFIER

U3O8 CONTENT  
 FREE WATER

## MARKETABILITY

PRIMARY PRODUCT  
 RECOVERABLE

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2
INFERRED	1,069,800,000	159,100,000
UNITS	MT ORE	MT ORE
YEAR/DATA	1963	1963

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	F205	18.0	WT-PCT
	H20	0	WT-PCT
2	F205	24.0	WT-PCT
	H20	0	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORDS 1 & 2: GIVEN GRADES ARE CUTOFF GRADES.

## SOURCE FOR RECORDS 1 AND 2:

SHELDON, F. P. PHYSICAL STRATIGRAPHY AND MINERAL RESOURCES OF PERMIAN ROCKS IN WESTERN WYOMING. U. S. GEOL. SURVEY PROF. PAPER 717-P, 1967, PP. 49-273, PLATES.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

ORE-MINERAL IN PLACE

-----EXPLORATION METHODS-----  
GEOLOGICAL

YEAR OF DISCOVERY: 1904

YEAR OF INITIAL PRODUCTION: 1948

YEAR OF FINAL PRODUCTION: 1949

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

## LITHOLOGY:

NAME OF FORMATION: PHOSPHORIA FORMATION      GEOLOGIC AGE: UPPER PERMIAN

DEFORMATION DESCRIPTION: FAULTING; MINOR FOLDING; MAJOR FAULTING

RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

GEOLOGIC AGE: TERTIARY

## ROCK TYPE:

PHOSPHORITE	IS ORE
MUDSTONE	NEAR ORE
CHERT	NEAR ORE
LIMESTONE	NEAR ORE
DOLOMITE	NEAR ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
APATITE	PHOSPHATES	APHANITIC
QUARTZ	FORMS OF SiO <sub>2</sub>	APHANITIC
ILLITE	SILICATES	APHANITIC
DOLOMITE	CARBONATES	APHANITIC
CALCITE	CARBONATES	APHANITIC
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	APHANITIC
FELDSPAR	SILICATES	APHANITIC
GYPSUM	SULFATES & CHROMATES	APHANITIC
FLUORITE	HALIDES	APHANITIC
ZIRCON	SILICATES	APHANITIC
TOURMALINE	SILICATES	APHANITIC
MONTMORILLONITE	SILICATES	APHANITIC
KAOLINITE	SILICATES	APHANITIC
SPHENE	SILICATES	APHANITIC
PYRITE	SULFIDES	APHANITIC

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SUELETTE RANGE

SEQUENCE NUMBER: 0560230102

NATION: USA STATE: WYOMING  
 TYPE OF OPERATION: SURFACE-UNDERGROUND  
 LATITUDE: N 42 DEG 12 MIN 00 SEC  
 UTM - ZONE: 10 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: PRE EDDY  
 ELEVATION: 7230 METERS  
 DATUM: SEA LEVEL

COUNTY: LINCOLN  
 CURRENT STATUS: PAST PRODUCER  
 LONGITUDE: W 110 DEG 59 MIN 00 SEC  
 NORTHING: 4671768 EASTING: 501376  
 PRECISION: 10 KILOMETERS  
 PRECISION: 100 METERS  
 YEAR OF INFORMATION: 1980

TYPE OF MINERAL HOLDING  
 PATENTED CLAIM; FEE OWNERSHIP;  
 FEDERAL LEASE

## ALTERNATE NAMES

COKEVILLE PHOSPHATE MINE  
 YORK CANYON  
 COAL CANYON  
 RAYMOND CANYON  
 LAYLAND CANYON  
 YORK CANYON MINE  
 COAL CANYON MINE

## OWNERSHIP

VARIOUS UNKNOWN OWNERS  
 U.S. GOVERNMENT

## STATUS

OWNER  
 OWNER

## COMMODITY

PHOSPHATE  
 URANIUM

## MODIFIER

U3O8 CONTENT  
 FREE WATER

## MARKETABILITY

PRIMARY PRODUCT

RECOVERABLE

PUBLISHED RESERVE-RESOURCE INFORMATION

UNDIFFERENTIATED  
 UNITS  
 YEAR/DATA  
 1910

RECORD 1  
 32,500,000  
 MT ORE  
 1910

RECORD 2  
 5,500,000  
 MT ORE  
 1910

RECORD 3  
 2,400,000  
 MT ORE

UNDIFFERENTIATED  
 UNITS  
 YEAR/DATA

RECORD 4  
 37,800,000  
 MT ORE  
 1967

RECORD 5  
 24,000,000  
 MT ORE  
 1967

## IN SITU GRADE:

RECORD	ASSAY FCRM	GRADE	UNIT
1	P205	31.0	WT-PCT
	H20	0	WT-PCT
2	P205	31.0	WT-PCT
	H20	0	WT-PCT
3	P205	35.0	WT-PCT
	H20	0	WT-PCT
4	P205	18.0	WT-PCT
	H20	0	WT-PCT
5	P205	24.0	WT-PCT
	H20	0	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORDS 1, GIVEN GRADE IS CUTOFF GRADE.  
2, 4, AND 5:

RECORD 1: RECORD CONTAINS TOTAL RESOURCES IN BOTH NORTHERN MAIN TREND OUTCROPS. EAST FLANK OF ANTICLINE ONLY IN THE RAYMOND CANYON-COAL CANYON OUTCROP.

RECORD 2: RECORD CONTAINS RESOURCES IN THE LAYLAND CANYON AREA.

RECORD 3: RECORD CONTAINS RESOURCES IN THE COKEVILLE BUTTE AREA.

RECORDS 4 AND 5: RECORDS CONTAIN RESOURCES FOR ALL THE SUBLLETTE RANGE AREA.

## SOURCE FOR RECORDS 1, 2, AND 3:

GALE, H. S., AND R. W. RICHARDS. PHOSPHATES. IN U.S. GEOL. SURVEY BULL. 430, 1910, PP. 457-553.

## SOURCE FOR RECORDS 4 AND 5:

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DEPOSIT\_HISTORICAL\_INFORMATION

## DISCOVERY METHOD:

ORE-MINERAL IN PLACE

-----EXPLORATION METHODS-----  
GEOLOGICAL

GEOLOGIC\_AND\_SPATIAL\_CHARACTERISTICS\_OF\_DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
SHAPE OF ORE BODY: TABULAR  
CONTROLLING FEATURES: LITHOLOGY  
DEGREE OF WALL ROCK ALTERATION: NONE

TYPE OF ORE BODY: SEDIMENTARY  
MODE OF ORIGIN: SEDIMENTATION  
SHAPE OF ORE BODY: TABULAR  
CONTROLLING FEATURES: LITHOLOGY  
DEGREE OF WALL ROCK ALTERATION: NONE

**LITHOLOGY:**

NAME OF FORMATION: PHOSPHORIA FORMATION      GEOLOGIC AGE: UPPER PERMIAN  
 DEFORMATION DESCRIPTION: FAULTING; MINOR FOLDING; MAJOR FAULTING  
 RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

GEOLOGIC AGE: TERTIARY

**ROCK TYPE:**

PHOSPHORITE	IS ORE
MUDSTONE	NEAR ORE
CHEM	NEAR ORE
LIMESTONE	NEAR ORE
DOLOMITE	NEAR ORE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
APATITE	PHOSPHATES	APHANITIC
QUARTZ	FORMS OF SiO <sub>2</sub>	APHANITIC
ILLITE	SILICATES	APHANITIC
DOLOMITE	CARBONATES	APHANITIC
CALCITE	CARBONATES	APHANITIC
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	APHANITIC
FELDSPAR	SILICATES	APHANITIC
GYPSUM	SULFATES & CHROMATES	APHANITIC
FLUORITE	HALIDES	APHANITIC
ZIRCON	SILICATES	APHANITIC
TOURMALINE	SILICATES	APHANITIC
MONTMORILLONITE	SILICATES	APHANITIC
KAGLINITE	SILICATES	APHANITIC
SELENITE	SILICATES	APHANITIC
PYRITE	SULFIDES	APHANITIC

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: GROS VENTRE RANGE

SEQUENCE NUMBER: 0560350030

NATION: USA STATE: WYOMING

COUNTY: SUBLLETTE

TYPE OF OPERATION: PROSPECT

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 43 DEG 25 MIN 00 SEC

LONGITUDE: W 110 DEG 15 MIN 00 SEC

UTM - ZONE: 12 HEMISPHERE: NORTHERN

NORTHING: 4807144 EASTING: 560718

POINT OF REFERENCE: ORE BODY

PRECISION: 10 KILOMETERS

ELEVATION: 3050 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1980

TYPE OF MINERAL HOLDING

FEE OWNERSHIP

OWNERSHIP

U.S. GOVERNMENT

STATUS

OWNER

COMMODITY

MODIFIER

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

URANIUM

U308 CONTENT

RECOVERABLE

WATER CONTENT

FREE WATER

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3
INFERRED	824,700,000	302,200,000	186,600,000
UNITS	MT ORE	MT ORE	MT ORE
YEAR/DATA	1963	1963	1963

IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	18.0	WT-PCT
	H2O	0	WT-PCT
2	P205	24.0	WT-PCT
	H2O	0	WT-PCT
3	P205	31.0	WT-PCT
	H2O	0	WT-PCT

RESERVE-RESOURCE - REMARKSRECORDS 1, GIVEN GRADES ARE CUTOFF GRADES.  
2 AND 3:

SOURCE FOR ALL RECORDS:

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PERMIAN ROCKS IN WESTERN WYOMING. U.S. GEOL. SURVEY PROF.  
PAPER 313-B, PP. 49-273.DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

ORE-MINERAL IN PLACE

GEOLOGICAL

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: TABULAR  
 CONTROLLING FEATURES: LITHOLOGY:  
 DEGREE OF WALL ROCK ALTERATION: NONE

TYPE OF ORE BODY: SEDIMENTARY  
 MODE OF ORIGIN: SEDIMENTATION  
 SHAPE OF ORE BODY: TABULAR  
 CONTROLLING FEATURES: LITHOLOGY:  
 DEGREE OF WALL ROCK ALTERATION: NONE

## LITHOLOGY:

NAME OF FORMATION: PHOSPHORIA FORMATION      GEOLOGIC AGE: UPPER PERMIAN  
 DEFORMATION DESCRIPTION: FAULTING; MINOR FOLDING; MAJOR FAULTING  
 RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION  
 GEOLOGIC AGE: TERTIARY

## ROCK TYPE:

PHOSPHORITE	IS ORE
MUDSTONE	NEAR ORE
CHEPT	NEAR ORE
LIMESTONE	NEAR ORE
DOLOMITE	NEAR ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
APATITE	PHOSPHATES	APHANITIC
QUARTZ	FORMS OF SiO <sub>2</sub>	APHANITIC
ILLITE	SILICATES	APHANITIC
DOLOMITE	CARBONATES	APHANITIC
CALCITE	CARBONATES	APHANITIC
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	APHANITIC
FELDSPAR	SILICATES	APHANITIC
GYPSUM	SULFATES & CHROMATES	APHANITIC
FLUORITE	HALIDES	APHANITIC
ZIRCON	SILICATES	APHANITIC
TOURMALINE	SILICATES	APHANITIC
MONTMORILLONITE	SILICATES	APHANITIC
KAOLINITE	SILICATES	APHANITIC
SPHERE	SILICATES	APHANITIC
PYRITE	SULFIDES	APHANITIC

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U.S. GEOLOGICAL SURVEY. DRIGGS, IDAHO; WYOMING, 1-DEGREE BY 2-DEGREE TOPOGRAPHIC MAP. U.S. GEOL. SURVEY, 1:250,000-SCALE MAP, 1955, 1 SHEET.

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: HOBACK RANGE

SEQUENCE NUMBER: 0560390026

NATION: USA STATE: WYOMING  
 TYPE OF OPERATION: PROSPECT  
 LATITUDE: N 43 DEG 13 MIN 00 SEC  
 UTM - ZONE: 12 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 2130 METERS  
 DATUM: SEA LEVEL

COUNTY: TETON  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 110 DEG 40 MIN 00 SEC  
 NORTHING: 4784714 EASTING: 527074  
 PRECISION: 10 KILOMETERS  
 PRECISION: 100 METERS  
 YEAR OF INFORMATION: 1980

TYPE OF MINERAL HOLDING  
FEE OWNERSHIPOWNERSHIP  
U.S. GOVERNMENTSTATUS  
OWNER

COMMODITY	MODIFIER
PHOSPHATE	PRIMARY PRODUCT
URANIUM	RECOVERABLE
WATER CONTENT	FREE WATER

MARKETABILITY
PRIMARY PRODUCT
RECOVERABLE

PUBLISHED RESERVE-RESOURCE INFORMATION

INFERRED	RECORD 1	RECORD 2
UNITS	1,019,700,000	289,400,000
YEAR/DATA	MT ORE	MT ORE
	1963	1963

IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	18.0	WT-PCT
	H2O	0	WT-PCT
2	P205	24.0	WT-PCT
	H2O	0	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORDS 1 GIVEN GRADES ARE CUTOFF GRADES.  
AND 2:

SOURCE FOR RECORDS 1 AND 2:

SHELDON, R. P. PHYSICAL STRATIGRAPHY AND MINERAL RESOURCES OF  
PERMIAN ROCKS IN WESTERN WYOMING. U. S. GEOL. SURVEY PROFESSIONAL  
PAPER 313-B, 1963, PP. 49-273.DEPOSIT HISTORICAL INFORMATIONDISCOVERY METHOD:  
ORE-MINERAL IN PLACE-----EXPLORATION METHODS-----  
GEOLOGICAL

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: TABULAR  
 CONTROLLING FEATURES: LITHOLOGY  
 DEGREE OF WALL ROCK ALTERATION: NONE

TYPE OF ORE BODY: SEDIMENTARY  
 MODE OF ORIGIN: SEDIMENTATION  
 SHAPE OF ORE BODY: TABULAR  
 CONTROLLING FEATURES: LITHOLOGY  
 DEGREE OF WALL ROCK ALTERATION: NONE

## LITHOLOGY:

NAME OF FORMATION: PHOSPHORIA FORMATION      GEOLOGIC AGE: UPPER PERMIAN  
 DEFORMATION DESCRIPTION: FAULTING; MINOR FOLDING; MAJOR FAULTING  
 RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION  
 GEOLOGIC AGE: TERTIARY

## ROCK TYPE:

PHOSPHORITE	IS ORE
MUDSTONE	NEAR ORE
CHERT	NEAR ORE
LIMESTONE	NEAR ORE
DOLOMITE	NEAR ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
APATITE	PHOSPHATES	APHANITIC
QUARTZ	FORMS OF SiO <sub>2</sub>	APHANITIC
ILLITE	SILICATES	APHANITIC
DOLOMITE	CARBONATES	APHANITIC
CALCITE	CARBONATES	APHANITIC
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	APHANITIC
FELDSPAR	SILICATES	APHANITIC
GYPSUM	SULFATES & CHROMATES	APHANITIC
FLUORITE	HALIDES	APHANITIC
ZIRCON	SILICATES	APHANITIC
TOURMALINE	SILICATES	APHANITIC
MONTMORILLONITE	SILICATES	APHANITIC
KAOLINITE	SILICATES	APHANITIC
SPHENE	SILICATES	APHANITIC
PYRITE	SULFIDES	APHANITIC

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DE VITO, R. H., AND D. N. STEVENS, ED. URANIFEROUS PHOSPHATE RESOURCES AND TECHNOLOGY AND ECONOMICS OF URANIUM RECOVERY FROM PHOSPHATE RESOURCES, UNITED STATES AND FREE WORLD: SUBCONTRACT 78-177-S TO DEPT. OF ENERGY CONTRACT 50-54-5903 (BENDIX FIELD ENG. CORP.) BY EARTH SCIENCES INC., 1979, 1396 PP. PLUS PLATES.

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FOREIGN DEPOSITS

ALGERIA

LOCATION AND GENERAL DEPOSIT INFORMATION

NATION: ALGERIA	SUBDIVISION: ANNABA
TYPE OF OPERATION: SURFACE	CURRENT STATUS: PRODUCER
LATITUDE: N 34 DEG 43 MIN 00 SEC	LONGITUDE: E 08 DEG 00 MIN 00 SEC
UTM - ZONE: 32 HEMISPHERE: NORTHERN	NORTHING: 3841881 EASTING: 408431
POINT OF REFERENCE: ORE BODY	PRECISION: 1 KILOMETER
ELEVATION: 835 METERS	PRECISION: 100 METERS
DATUM: SEA LEVEL	YEAR OF INFORMATION: 1981

**COMMODITY** **MARKETABILITY**  
**PHOSPHATE** **PRIMARY PRODUCT**

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2
UNDIFFERENTIATED UNITS	500,000,000 MT ORE	500,000,000 MT ORE
YEAR/DATA	1969	1965

IN SITU GRADE:			
RECORD	ASSAY FORM	GRADE	UNIT
2	P205	24.6	WT-PCT

**RESERVE-RESOURCE - REMARKS**

SOURCE FOR RECORD 1:  
MINING MAGAZINE. VOL. 121, NO. 2, AUGUST 1969, P. 120.

SOURCE FOR RECORD 2:  
PHOSPHORUS AND POTASSIUM. NO. 15. JAN/FEB 1965, PP 17 - 21.

DEPOSIT\_HISTORICAL\_INFORMATION

## -----EXPLORATION METHODS-----

YEAR OF DISCOVERY: 1900

## CORE DRILLING

YEAR OF INITIAL PRODUCTION: 1966

## GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
MODE OF CRIGIN: SEDIMENTATION  
SHAPE OF ORE BODY: MASSIVE  
CONTROLLING FEATURES: FOLDING

## MINERALIZED ZONE:

AVERAGE DEPTH: 22.5 METERS  
 AVERAGE THICKNESS: 33 METERS

MINIMUM DEPTH: 0 METERS  
 STRIKE/DIP: N80E/02N

## UNCONSOLIDATED MATERIAL:

AVERAGE THICKNESS: 22.5 METERS

## LITHOLOGY:

NAME OF FORMATION: METLAOUI FORMATION GEOLOGIC AGE: PALEOCENE  
 DEFORMATION DESCRIPTION: MINOR FOLDING  
 RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

## ROCK TYPE:

PHOSPHORITE	IS ORE
LIMESTONE	LIES OVER ORE; LIES UNDER ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
COLLOPHANE	PHOSPHATES
DOLCIMITE	CARBONATES
KAOLINITE	SILICATES

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: OPEN-PIT  
 CAPACITY: 12000 UNITS: MT ORE/DAY

DESCRIPTION OF COVER:  
 SAND, GRAVEL;  
 HARD ROCKS

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE	LOCATION: ALGERIA
LATITUDE: N 34 43 00	LONGITUDE: E 08 00 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: TRUCK	DISTANCE (KM): 2.3
DESTINATION FACILITY: MILL (ON-SITE)	LOCATION: ALGERIA
LATITUDE: N 34 43 00	LONGITUDE: E 08 00 00

## BENEFICIATION:

METHOD: CLASSIFIER	----- DESCRIPTION OF MILLING -----
DESIGN CAPACITY: 12000	ORE/ CRUSH/GRIND/SCREEN/STOCKPILE/DESLIME/
UNITS: MT ORE/DAY	CALCINE/GRIND/WASH/SCREEN/DRY/SHIP

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P20F	71	30.6	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE)	LOCATION: ALGERIA
LATITUDE: N 34 43 00	LONGITUDE: E 08 00 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: PAIL	DISTANCE (KM): 340
DESTINATION FACILITY: PORT	LOCATION: ALGERIA

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ANGOLA

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: LACUNGA RIVER

SEQUENCE NUMBER: 7620750001

NATION: ANGOLA

SUBDIVISION: ZAIRE

TYPE OF OPERATION: SURFACE

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: S 06 DEG 57 MIN 00 SEC

LONGITUDE: E 12 DEG 52 MIN 00 SEC

UTM - ZONE: 33 HEMISPHERE: SOUTHERN

NORTHING: 9231295 EASTING: 264290

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 100 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING

GOVERNMENT CONTROLLED

ALTERNATE NAMES

KINDONAKASI

GUINDONALAXI

OWNERSHIP

PHOSPHATE LXREACTION CO. OF ANGOLA (FOSFANG)

STATUS

BULGAREOMINA (OF BULGARIA)

OWNER

OPERATOR

COMMODITY

PHOSPHATE

MODIFIER

URANIUM

MARKETABILITY

PRIMARY

U308

RECOVERABLE

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2
INDICATED	-----	27,500,000
INFERRED	200,000.000	-----
UNITS	MT ORE	MT ORE
YEAR/DATA	1981	1981

IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
2	P205	19.4	WT-PCT

## RESERVE-RESOURCE - REMARKS

SOURCE FOR RECORD 1:

MINING JOURNAL. ANGOLAN PHOSPHATE MINING. MARCH 13, 1981.

SOURCE FOR RECORD 2:

BRITISH SULPHUR. WORLD SURVEY OF PHOSPHATE DEPOSITS. 4TH EDITION, 1980.

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1951

-----EXPLORATION METHODS-----  
AERIAL SURVEY/PETROLEUM EXPLORATION

## GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
MODE OF ORIGIN: SEDIMENTATION  
SHAPE OF ORE BODY: TABULAR  
CONTROLLING FEATURES: LITHOLOGY  
DEGREE OF WALL ROCK ALTERATION: NONE

UNCONSOLIDATED MATERIAL:  
AVERAGE THICKNESS: 2.0 METERS MINIMUM THICKNESS: 0.1 METER

LITHOLOGY:  
GEOLOGIC AGE: EOCENE  
DEFORMATION DESCRIPTION: NO DEFORMATION  
ROCK TYPE:  
SAND IS ORE; GANGUE

MINERALIZATION:	MINERAL CLASS	GRAIN SIZE
MINERAL NAME	PHOSPHATES	VARIABLE
COLLOPHANE	FORMS OF $SiO_2$	VARIABLE
QUARTZ		

## BIBLIOGRAPHY RECORDS

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AUSTRALIALOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: CHRISTMAS ISLAND NO. 1      SEQUENCE NUMBER: 6020050001

NATION: AUSTRALIA

TYPE OF OPERATION: SURFACE

LATITUDE: S 10 DEG 25 MIN 10 SEC

UTM - ZONE: 48 HEMISPHERE: SOUTHERN

POINT OF REFERENCE: ORE BODY

ELEVATION: 300 METERS

DATUM: SEA LEVEL

SUBDIVISION: CHRISTMAS ISLAND

CURRENT STATUS: PRODUCER

LONGITUDE: E 105 DEG 42 MIN 57 SEC

NORTHING: 8847918 EASTING: 578351

PRECISION: 10 KILOMETERS

PRECISION: 10 METERS

YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

CHRISTMAS ISLAND

CHRISTMAS ISLAND NO. 2

## OWNERSHIP

COMMONWEALTH OF AUSTRALIA

## STATUS

OWNER

COMMONWEALTH OF NEW ZEALAND

OWNER

CHRISTMAS ISLAND PHOSPHATE COMMISSION (CIPC)

OPERATOR

BRITISH PHOSPHATE COMMISSION (BPC)

OPERATOR

## COMMODITY

## MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1
INDICATED	200,000,000
UNITS	MT ORE
YEAR/DATA	1966

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P	16	WT-PCT
	P	14	WT-PCT
	P	11.5	WT-PCT

## RESERVE-RESOURCE - REMARKS

ALL RECORDS: THE INDICATED ORE RESERVE IS FOR THE ENTIRE ISLAND, AND IS DIVIDED INTO THREE HORIZONS:

"A" ORE (DEEPEST) = 16 PERCENT PHOSPHORUS

"B" ORE (MIDDLE HORIZON) = 14 PERCENT PHOSPHORUS

"C" ORE (UPPER HORIZON) = 11-12 PERCENT PHOSPHORUS

MINING AT CHRISTMAS ISLAND NO. 1 INVOLVES HORIZONS "A" PLUS "B".

## SOURCE FOR RECORD 1:

TYRER, T. G. THIS IS CHRISTMAS, THE PHOSPHATE ISLAND.

PUBLISHED FOR THE CHRISTMAS ISLAND PHOSPHATE COMMISSION BY THE NEW ZEALAND DAIRY EXPORTER.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD: -----EXPLORATION METHODS-----  
 ORE-MINERAL IN PLACE CORE DRILLING/BEDROCK SAMPLING  
 YEAR OF DISCOVERY: 1887  
 YEAR OF INITIAL PRODUCTION: 1900

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
 MODE OF ORIGIN: SEDIMENTATION  
 SHAPE OF ORE BODY: IRREGULAR

MINERALIZED ZONE:  
 AVERAGE DEPTH: 2 METERS MINIMUM DEPTH: 1 METER  
 AVERAGE THICKNESS: 4.5 METERS

UNCONSOLIDATED MATERIAL:  
 AVERAGE THICKNESS: 2 METERS MINIMUM THICKNESS: 1 METER

LITHOLOGY:  
 GEOLOGIC AGE: TERTIARY  
 ROCK TYPE:  
 LIMESTONE LIES UNDER ORE; NEAR ORE  
 PHOSPHORITE IS ORE

MINERALIZATION:  
 MINERAL NAME MINERAL CLASS  
 APATITE PHOSPHATES

MINE/MILL INFORMATION

SURFACE MINING:  
 METHOD: STRIPPING  
 CAPACITY: 6800 UNITS: MT ORE/DAY  
 DESCRIPTION OF COVER:  
 SAND, GRAVEL;  
 SAND, SILT  
 AVERAGE COVER THICKNESS: 2 METERS

TRANSPORTATION (ORE):  
 ORIGINATING FACILITY: MINE LOCATION: CHRISTMAS ISL. NO. 1  
 LATITUDE: S 10 25 19 LONGITUDE: E 105 42 57  
 PERCENT SHIPPED: 100  
 METHOD OF TRANSPORTATION: TRUCK  
 DESTINATION FACILITY: MILL (ON-SITE) LOCATION: CHRISTMAS ISLAND MILL  
 LATITUDE: S 10 25 19 LONGITUDE: E 105 42 57

BENEFICIATION:  
 METHOD: SIZING -----DESCRIPTION OF MILLING-----  
 DESIGN CAPACITY: 6800 ORE/STOCKPILE/WASH/SCREEN SIZE/DRY/  
 UNITS: MT ORE/DAY DUST RECOVERY/STOCKPILE

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	72	36.0	WT-PCT

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK  
ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: CHRISTMAS ISLAND MILL  
LATITUDE: S 10 25 19 LONGITUDE: E 105 42 57  
PERCENT SHIPPED: 100  
METHOD OF TRANSPORTATION: CONVEYOR DISTANCE (KM): 0.67  
DESTINATION FACILITY: PORT LOCATION: DOCKSIDE AT MILL  
LATITUDE: S 10 25 19 LONGITUDE: E 105 42 57

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----. CALCINATION OF B-GRADE PHOSPHATE. ADELAIDE, SOUTH AUSTRALIA, 8/81.

TYRER, T. G. THIS IS CHRISTMAS, THE PHOSPHATE ISLAND. PUBLISHED FOR THE CHRISTMAS ISLAND PHOSPHATE COMMISSION BY THE NEW ZEALAND DAIRY EXPORTER.

URANIFFEROUS PHOSPHATE RESOURCES OF THE FREE WORLD. CHAPTER 5 OF SURVEY REPORT BY EARTH SCIENCES INC., TO U. S. DEPT. OF ENERGY, GJBX 110 (79) GRAND JUNCTION, COLORADO.

WHITE, M. S. SUPERPHOSPHATE FROM CHRISTMAS ISLAND PHOSPHATE ROCK. NEW ZEALAND FERTILIZER MANUFACTURER'S RESEARCH ASSOCIATION, 1 FEBRUARY 1971.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: CHRISTMAS ISLAND NO. 2      SEQUENCE NUMBER: 6020050002

NATION: AUSTRALIA	SUBDIVISION: CHRISTMAS ISLAND
TYPE OF OPERATION: SURFACE	CURRENT STATUS: DEVELOPING DEPOSIT
LATITUDE: S 10 DEG 25 MIN 19 SEC	LONGITUDE: E 105 DEG 42 MIN 57 SEC
UTM - ZONE: 48 HEMISPHERE: SOUTHERN	NORTHING: 8847918 EASTING: 578351
POINT OF REFERENCE: ORE BODY	PRECISION: 10 KILOMETERS
ELEVATION: 300 METERS	PRECISION: 10 METERS
DATUM: SEA LEVEL	YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

CHRISTMAS ISLAND  
CHRISTMAS ISLAND NO. 1

OWNERSHIP	STATUS
COMMONWEALTH OF AUSTRALIA	OWNER
COMMONWEALTH OF NEW ZEALAND	OWNER
CHRISTMAS ISLAND PHOSPHATE COMMISSION (CIPC)	OPERATOR
BRITISH PHOSPHATE COMMISSION (BPC)	OPERATOR

COMMODITY	MARKETABILITY
PHOSPHATE	PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

INDICATED	RECORD 1
UNITS	200,000,000
YEAR/DATA	MT ORE
	1966

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P	16	WT-PCT
	P	14	WT-PCT
	P	11.5	WT-PCT

## RESERVE-RESOURCE - REMARKS

ALL RECORDS: THE INDICATED ORE RESERVE IS FOR THE ENTIRE ISLAND, AND IS DIVIDED INTO THREE HORIZONS:

"A" ORE (DEEPEST) = 16 PERCENT PHOSPHORUS  
 "B" ORE (MIDDLE HORIZON) = 14 PERCENT PHOSPHORUS  
 "C" ORE (UPPER HORIZON) = 11-12 PERCENT PHOSPHORUS

MINING OF CHRISTMAS ISLAND NO. 2 WOULD INVOLVE MINING THE REMAINDER OF THE "B" HORIZON AFTER THE "A" HORIZON IS DEPLETED BY CHRISTMAS ISLAND NO. 1 MINING.

## SOURCE FOR RECORD 1:

TYRER, T. G. THIS IS CHRISTMAS, THE PHOSPHATE ISLAND.  
 PUBLISHED FOR THE CHRISTMAS ISLAND PHOSPHATE COMMISSION BY THE NEW ZEALAND DAIRY EXPORTER.

DEPOSIT\_HISTORICAL\_INFORMATION

DISCOVERY METHOD:

ORE-MINERAL IN PLACE

-----EXPLORATION METHODS-----

CORE DRILLING/BEDROCK SAMPLING

YEAR OF DISCOVERY: 1887

GEOLOGIC\_AND\_SPATIAL\_CHARACTERISTICS\_OF\_DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: IRREGULAR

MINERALIZED ZONE:

AVERAGE DEPTH: 2 METERS

MINIMUM DEPTH: 1 METER

AVERAGE THICKNESS: 2 METERS

UNCONSOLIDATED MATERIAL:

AVERAGE THICKNESS: 2 METERS

MINIMUM THICKNESS: 1 METER

LITHOLOGY:

GEOLOGIC AGE: TERTIARY

ROCK TYPE:

LIMESTONE

LIES UNDER ORE

PHOSPHORITE

IS ORE

MINERALIZATION:

MINERAL NAME

MINERAL CLASS

APATITE

PHOSPHATES

BIBLIOGRAPHY\_RECORDS

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\_\_\_\_\_. CALCINATION OF B-GRADE PHOSPHATE. ADELAIDE, SOUTH AUSTRALIA, 8/81.

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WHITE, M. S. SUPERPHOSPHATE FROM CHRISTMAS ISLAND PHOSPHATE ROCK. NEW ZEALAND FERTILIZER MANUFACTURER'S RESEARCH ASSOCIATION, 1 FEBRUARY 1971.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: WONARAH

SEQUENCE NUMBER: 6020250018

NATION: AUSTRALIA

SUBDIVISION: NORTHERN TERRITORY  
CURRENT STATUS: EXPLORED DEPOSIT  
LONGITUDE: E 136 DEG 20 MIN 00 SEC  
NORTHING: 7806541 EASTING: 639631  
PRECISION: 1 KILOMETER  
YEAR OF INFORMATION: 1981TYPE OF OPERATION: UNKNOWN  
LATITUDE: S 19 DEG 50 MIN 00 SEC  
UTM - ZONE: 53 HEMISPHERE: SOUTHERN  
POINT OF REFERENCE: ORE BODYTYPE OF MINERAL HOLDING  
MINING LEASESOWNERSHIP  
REGIS MINES NLSTATUS  
OWNERCOMMODITY  
PHOSPHATEMARKETABILITY  
PRIMARY PRODUCTPUBLISHED RESERVE-RESOURCE INFORMATION

INFERRED	RECORD 1
UNITS	900,000,000
YEAR/DATA	MT ORE 1980

IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	15.7	WT-PCT

## RESERVE-RESOURCE - REMARKS

SOURCE FOR RECORD 1:

REGISTER OF AUSTRALIAN MINING. PHOSPHATE: READY STOCKS DWINDLE.  
1980, PP. 78.DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1966

-----EXPLORATION METHODS-----  
DRILLING/RADIOACTIVITY SURVEYGEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSITTYPE OF ORE BODY: SEDIMENTARY  
MODE OF ORIGIN: SEDIMENTATION  
SHAPE OF ORE BODY: TABULAR  
CONTROLLING FEATURES: BEDDING

MINERALIZED ZONE:

AVERAGE DEPTH: 31 METERS  
AVERAGE LENGTH: 23500 METERS  
AVERAGE THICKNESS: 23 METERSMINIMUM DEPTH: 17 METERS  
AVERAGE WIDTH: 5500 METERS

## LITHOLOGY:

NAME OF FORMATION:	WONRAH BEDS	GEOLOGIC AGE:	MIDDLE CAMBRIAN
ROCK TYPE:			
SILT	LIES OVER ORE		
CHERT	LIES OVER ORE		
SANDSTONE	LIES OVER ORE		
PHOSPHATIC MUDSTONE	IS ORE		

## LITHOLOGY:

NAME OF FORMATION:	UNDIFFERENTIATED BASEMENT
DEFORMATION DESCRIPTION:	MINOR FOLDING
RELATIONSHIP TO MINERALIZATION:	MINERALIZATION DURING DEFORMATION
ROCK TYPE:	
UNSPECIFIED EXTRUSIVE	LIES UNDER ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
COLLOPHANE	PHOSPHATES
QUARTZ	FORMS OF SIO <sub>2</sub>
CHERT	FORMS OF SIO <sub>2</sub>

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HOWARD, PETER F. AND F. A. PERRINO. WONORAH PHOSPHATE DEPOSIT, GEORGINA BASIN, NORTHERN TERRITORY. A.I.M.M. NO. 4, IND. MINS. AND ROCKS, 1976, PP. 273-277.

REGISTER OF AUSTRALIAN MINING. PHOSPHATE: READY STOCKS DWINDLE. 1980, PP. 78.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: DUCHESS

SEQUENCE NUMBER: 6020350001

NATION: AUSTRALIA

SUBDIVISION: QUEENSLAND

TYPE OF OPERATION: SURFACE

CURRENT STATUS: TEMPORARY SHUTDOWN

LATITUDE: S 21 DEG 53 MIN 00 SEC

LONGITUDE: E 139 DEG 58 MIN 00 SEC

UTM - ZONE: 54 HEMISPHERE: SOUTHERN

NORTHING: 7579869 EASTING: 393245

POINT OF REFERENCE: ORE BODY

PRECISION: 5 KILOMETERS

ELEVATION: 396 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

DUCHESS AND ARDMORE

ARDMORE

PHOSPHATE HILL

## OWNERSHIP

WESTERN MINING CORPORATION HOLDING LTD.

## STATUS

OWNER-OPERATOR

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2
MEASURED	504,00,000	-----
INDICATED	-----	914,000,000
UNITS	MT ORE	MT ORE
YEAR/DATA	1980	1980

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	18.3	WT-PCT
2	P205	16.9	WT-PCT

## RESERVE-RESOURCE - REMARKS

## SOURCE FOR RECORDS 1 AND 2:

PHOSPHORUS AND POTASSIUM. THE PHOSPHATE DEPOSITS OF AUSTRALIA.  
NO. 119, NOV/DEC 1980, PP. 21.

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1966

----- EXPLORATION METHODS -----  
TRENCHING/CORE DRILLING/SUBSURFACE  
GEOLOGICAL MAPPING/MAGNETIC SURVEY/  
SEISMIC/SURVEY/PERCUSSION/DRILLING/ROTARY  
DRILLING/OTHER DRILLING

YEAR OF INITIAL

PRODUCTION: 1975

YEAR OF FINAL PRODUCTION: 1978

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

## MINERALIZED ZONE:

AVERAGE THICKNESS: 11 METERS

## LITHOLOGY:

NAME OF FORMATION: BEETLE CREEK FORMATION

GEOLOGIC AGE: CAMBRIAN

DEFORMATION DESCRIPTION: FAULTING

## ROCK TYPE:

SILT	GANGUE
SHALE	GANGUE
CHERT	GANGUE; LIES UNDER ORE
SILTSTONE	GANGUE; LIES UNDER ORE
LIMESTONE	LIES OVER ORE; NEAR ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
APATITE	PHOSPHATES
COLLOPHANE	PHOSPHATES

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: STRIPPING

CAPACITY: 800

UNITS: MT ORE/DAY

## DESCRIPTION OF COVER:

SAND, SILT;  
HARDPAN

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE

LOCATION: ARDMORE/DUCHESS MINE

LATITUDE: S 21 53 00

LONGITUDE: E 139 58 00

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: TRUCK

DISTANCE (KM): 1.5

DESTINATION FACILITY: MILL (ON-SITE)

LOCATION: ARDMORE/DUCHESS MILL

LATITUDE: S 21 53 00

LONGITUDE: E 139 58 00

## BENEFICIATION:

METHOD: WASHING

----- DESCRIPTION OF MILLING -----

DESIGN CAPACITY: 800

ORE/CRUSH/SCREEN/WASH/SCREEN/BLEND/DESLIME/

UNITS: MT ORE/DAY

SCREEN/DRY STOCKPILE

PRODUCT ASSAY FORM RECOVERY CONCENTRATE GRADE UNIT  
PHOSPHATE ROCK P205 85 33.9 WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE)

LOCATION: ARDMORE/DUCHESS MILL

LATITUDE: S 21 53 00

LONGITUDE: E 139 58 00

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: RAIL

LOCATION: TOWNSVILLE

DESTINATION FACILITY: PORT

BIBLIOGRAPHY RECORDS

COOK, P. J. AUSTRALIAN PHOSPHATE ROCK DEPOSITS AND OCCURRENCES. FERT. MIN. POT. IN ASIA & PACIFIC, AUSTRALIAN MINES HANDBOOK, PHOSPHATE SECTION, 1976-77. HAWAII 1979.

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COOK, P. J. AND J. H. SHERGOLD. PROTEROZOIC AND CAMBRIAN PHOSPHORITE OF ASIA AND AUSTRALIA - A PROGRESS REPORT. HAWAII 1979.

ENGINEERING AND MINING JOURNAL. AUSTRALIA'S DUCHESS PHOSPHATE MINE DUE ON STREAM AT 1 MILLION TPY. MARCH 1977.

FLEMING, M. R., A. M. STONE, AND G. ROMENSKY. AUTOMATIC TRAIN LOADING OF ROCK PHOSPHATE AT PHOSPHATE HILL. AUSTRALASIAN I. M. & M. CONFERENCE, QUEENSLAND, SEPT. 1978.

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ROGERS, J. K., AND N. J. CRASF. THE PHOSPHATE HILL ROCK PHOSPHATE DEPOSIT, NORTHWEST QUEENSLAND, AUSTRALIA - AN OUTLINE OF GEOLOGICAL DEVELOPMENT. PROC. FERT. RAW MATERIALS WORKSHOP, HONOLULU 1979, JUNE 1980.

RUSSELL, R. T., AND N. A. TRUEMAN. THE GEOLOGY OF THE DUCHESS PHOSPHATE DEPOSITS, NORTHWESTERN QUEENSLAND, AUSTRALIA. ECON. GEOL., VOL. 66, 1971, PP. 1186-1214.

THOMSON, L. C. AND R. T. RUSSELL. DISCOVERY, EXPLORATION AND INVESTIGATIONS OF PHOSPHATE DEPOSITS IN QUEENSLAND. PROC. AUST. INT. MIN. MET., NO. 240, DECEMBER 1971.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: LADY ANNIE/LADY JANE	SEQUENCE NUMBER: 6020350008
NATION: AUSTRALIA	SUBDIVISION: QUEENSLAND
TYPE OF OPERATION: SURFACE	CURRENT STATUS: EXPLORED DEPOSIT
LATITUDE: S 19 DEG 40 MIN 00 SEC	LONGITUDE: E 139 DEG 10 MIN 00 SEC
UTM - ZONE: 54 HEMISPHERE: SOUTHERN	NORTHING: 7824499 EASTING: 307794
POINT OF REFERENCE: ORE BODY	PRECISION: GREATER THAN 10 KILOMETERS
	YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

LADY ANNIE AND LADY JANE  
LADY ANNIE

OWNERSHIP	STATUS
WESTERN MINING CORPORATION HOLDING LTD.	OWNER

COMMODITY	MARKETABILITY
PHOSPHATE	PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

MEASURED	RECORD 1
UNITS	486,000,000
YEAR/DATA	MT ORE
	1980

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	17.0	WT-PCT

## RESERVE-RESOURCE - REMARKS

## SOURCE FOR RECORD 1:

PHOSPHOROUS AND POTASSIUM. THE PHOSPHATE DEPOSITS OF AUSTRALIA.  
NO. 110, NOV/DEC. 1980, PP. 76-77.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:	-----EXPLORATION METHODS-----
ORE-MINERAL IN PLACE	SUBSURFACE GEOLOGICAL MAPPING/CORE DRILLING
YEAR OF DISCOVERY: 1967	

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
MODE OF ORIGIN: SEDIMENTATION

## MINERALIZED ZONE:

AVERAGE DEPTH: 5.5 METERS	MINIMUM DEPTH: 0 METERS
AVERAGE LENGTH: 26000 METERS	AVERAGE WIDTH: 5000 METERS
AVERAGE THICKNESS: 5.5 METERS	

## LITHOLOGY:

NAME OF FORMATION:	BEETLE CREEK FORMATION	GEOLLOGIC AGE:	CAMBRIAN
ROCK TYPE:			
SILTSTONE	LIES OVER ORE; NEAR ORE		
SANDSTONE	LIES OVER ORE; NEAR ORE		
CHERT	LIES OVER ORE; NEAR ORE		
PHOSPHORITE	IS ORE		
LIMESTONE	LIES UNDER ORE; ENCLOSSES ORE		
DOLOMITE	LIES UNDER ORE; ENCLOSSES ORE		

## MINERALIZATION:

MINERAL NAME	MINEFAL CLASS	GRAIN SIZE
COLLOPHANE	PHOSPHATES	PHANERITIC-FINE
APATITE	PHOSPHATES	

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: D TREE

SEQUENCE NUMBER: 6020350035

NATION: AUSTRALIA

SUBDIVISION: QUEENSLAND

TYPE OF OPERATION: SURFACE

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: S 19 DEG 43 MIN 00 SEC

LONGITUDE: E 138 DEG 57 MIN 00 SEC

UTM - ZONE: 54 HEMISPHERE: SOUTHERN

NORTHING: 7818704 EASTING: 285139

POINT OF REFERENCE: ORE BODY

PRECISION: 5 KILOMETERS

YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

D-TREE

## OWNERSHIP

INTERNATIONAL MINERAL &amp; CHEMICAL DEV. CORP. (I.M.C.)

## STATUS

OWNER

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

MEASURED	RECORD 1
UNITS	250,000,000
YEAR/DATA	MT ORE
	1980

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	18.6	WT-PCT

## RESERVE/RESERVE - REMARKS

## SOURCE FOR RECORD 1:

PHOSPHOROUS AND POTASSIUM. THE PHOSPHATE DEPOSITS OF AUSTRALIA.  
NO. 110, NOV/DEC 1980

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

-----EXPLORATION METHODS-----  
ORE-MINERAL IN PLACE

YEAR OF DISCOVERY: 1967

SUBSURFACE GEOLOGICAL MAPPING/CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

CONTROLLING FEATURES: FOLDING

## MINERALIZED ZONE:

AVERAGE DEPTH: 15 METERS

MINIMUM DEPTH: 0 METERS

AVERAGE LENGTH: 22500 METERS

AVERAGE THICKNESS: 6 METERS

AVERAGE WIDTH: 5500 METERS

## LITHOLOGY:

NAME OF FORMATION: BEETLE CREEK GEOLOGIC AGE: CAMBRIAN

**ROCK TYPE:**

PHOSPHORITE	IS ORE
SANDSTONE	LIES OVER ORE; NEAR ORE
CHEFT	LIES OVER ORE; NEAR ORE
SILTSTONE	LIES OVER ORE; NEAR ORE
LIMESTONE	LIES UNDER ORE; ENCLOSSES ORE
DOLOMITE	LIES UNDER ORE; ENCLOSSES ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
COLLOPHANE	PHOSPHATES

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TREE, WONARAH AND SHERRIN CREEK PHOSPHORITE DEPOSITS OF THE GEORGINA BASIN;  
NORTHERN AUSTRALIA. ECON. GEOL. VOL. 74, 1979, PP. 260-284.

PHOSPHORUS AND POTASSIUM. THE PHOSPHATE DEPOSITS OF AUSTRALIA. PHOSPHORUS AND POTASSIUM. NO. 110, NOV/DEC. 1980.

REGISTER OF AUSTRALIAN MINING. 1980.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: NORTHERN DEPOSITS

SEQUENCE NUMBER: 6020350047

NATION: AUSTRALIA

SUBDIVISION: QUEENSLAND

TYPE OF OPERATION: SURFACE

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: S 18 DEG 40 MIN 00 SEC

LONGITUDE: E 138 DEG 20 MIN 00 SEC

UTM - ZONE: 54 HEMISPHERE: SOUTHERN

NORTHING: 7934082 EASTING: 218694

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
MINERALS ONLY

## ALTERNATE NAMES

RIVERSLEIGH

PHANTOM HILLS

MT. JENNIFER

BABBLING BROOK HILL

MT. O'CONNOR

HIGHLAND PLAINS

QUEENS LAND - NORTHERN DEPOSIT

## OWNERSHIP

WESTERN MINING CORP. HOLDING LTD.

## STATUS

QUEENSLAND PHOSPHATE LTD.

OWNER

OPERATOR

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3
MEASURED	176,000,000	-----	-----
INDICATED	-----	38,000,000	-----
INFERRRED	-----	-----	27,000,000
UNITS	MT ORE	MT ORE	MT ORE
YEAR/DATA	1972	1972	1972

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	14.7	WT-PCT
2	P205	16.8	WT-PCT
3	P205	17.4	WT-PCT

## RESERVE-RESOURCE - REMARKS

## SOURCE FOR RECORDS 1, 2, AND 3:

ROGERS, J. K., AND R. E. KEEVERS. ECONOMIC GEOLOGY OF AUST. AND PAPUA, NEW GUINEA. IND. MINES AND ROCKS, AUST. MIN. METALL. MONOGRAPH, 4. SEC. 8, PP. 251-265.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

ORE-MINERAL IN PLACE

YEAR OF DISCOVERY: 1966

-----EXPLORATION METHODS-----  
DRILLING/TEST SHAFT/GEOCHEMICAL

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: FAULTING

## LITHOLOGY:

NAME OF FORMATION: BORDER WATERHOLE FORMATION GEOLOGIC AGE: MIDDLE CAMBRIAN

DEFORMATION DESCRIPTION: FAULTING

GEOLOGIC AGE OF DEFORMATION: AFTER CAMBRIAN

## ROCK TYPE:

PHOSPHORITE	IS ORE
MUDSTONE	IS ORE; LIES OVER ORE
SILTSTONE	IS ORE; LIES OVER ORE
CHERT	IS ORE; LIES OVER ORE
SANDSTONE	NEAR ORE; LIES OVER ORE
LIMESTONE	IS ORE; LIES OVER ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
COLLOPHANE	PHOSPHATES

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THOMSON, L. D. AND R. T. RUSSELL. DISCOVERY, EXPLORATION, &amp; INVESTIGATIONS OF PHOSPHATE DEPOSITS IN QUEENSLAND. PROC. AUST. INST. MIN. MET., NO. 240, DEC. 1971.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SHERRIN CREEK/LILY CREEK      SEQUENCE NUMBER: 6020350051

NATION: AUSTRALIA  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: S 20 DEG 10 MIN 00 SEC  
 UTM - ZONE: 54 HEMISPHERE: SOUTHERN  
 POINT OF REFERENCE: ORE BODY

SUBDIVISION: QUEENSLAND  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: E 138 DEG 44 MIN 00 SEC  
 NORTHING: 7768591 EASTING: 263094  
 YEAR OF INFORMATION: 1981

ALTERNATE NAMES  
ENGINEOWNERSHIP  
CONTINENTAL OIL CORPORATIONSTATUS  
OWNERCOMMODITY  
PHOSPHATEMARKETABILITY  
PRIMARY PRODUCTPUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2
INFERRED	233,000,000	212,000,000
UNITS	MT ORE	MT ORE
YEAR/DATA	1978	1978

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	16	WT-PCT
2	P205	13.4	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORD 1: RESERVES ATTRIBUTED TO SHERRIN CREEK DEPOSIT.  
 RECORD 2: RESERVES ATTRIBUTED TO LILY CREEK DEPOSIT.

## SOURCE FOR RECORDS 1 AND 2:

AUSTRALIAN MINES HANDBOOK. 1977/1978.

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1966

-----EXPLORATION METHODS-----  
DRILLINGGEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
 MODE OF ORIGIN: SEDIMENTATION  
 SHAPE OF ORE BODY: TABULAR  
 CONTROLLING FEATURES: LITHOLOGY; BEDDING

## MINERALIZED ZONE:

STRIKE/DIP: N01W/01S  
 AVERAGE LENGTH: 22500 METERS

AVERAGE WIDTH: 5500 METERS  
 AVERAGE THICKNESS: 27 METERS

## LITHOLOGY:

NAME OF FORMATION: BEETLE CREEK FORMATION

GEOLOGIC AGE: MIDDLE CAMBRIAN

DEFORMATION DESCRIPTION: NO DEFORMATION

## ROCK TYPE:

PHOSPHORITE

IS ORE

SILTSTONE

ENCLOSES ORE

DOLomite

NEAR ORE

CHERT

NEAR ORE

## MINERALIZATION:

MINERAL NAME

MINERAL CLASS

COLLOPHANE

PHOSPHATES

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REGISTER OF AUSTRALIAN MINING. 1980.



## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
COLLOPHANE	PHOSPHATES
QUARTZ	FORMS OF SiO <sub>2</sub>

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WILLIAMS, H. E. O CLIMA DO BRAZIL. BRAZIL, SERV. GEOL. MIN., NOTAS PRELIMINARES E ESTUDOS, NUM. 8. RIO DE JANEIRO, 1937.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: CATALAO (GOIASFERTIL) SEQUENCE NUMBER: 3510170013

NATION: BRAZIL SUBDIVISION: GOIAS  
 TYPE OF OPERATION: SURFACE CURRENT STATUS: PRODUCER  
 LATITUDE: S 18 DEG 08 MIN 00 SEC LONGITUDE: W 47 DEG 48 MIN 00 SEC  
 UTM - ZONE: 23 HEMISPHERE: SOUTHERN NORTHING: 7992929 EASTING: 203708  
 POINT OF REFERENCE: ORE BODY PRECISION: 1 KILOMETER  
 ELEVATION: 930 METERS PRECISION: 500 METERS  
 DATUM: SEA LEVEL YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
 ALVARAS (CLAIMS) 90 AND 91 (1968)

ALTERNATE NAMES  
 CATALAO 1 (GOIASFERTIL)  
 GOIASFERTIL CATALAO  
 OUVIDOR  
 FAZENDA CHAPADAO

OWNERSHIP	STATUS
GOIAS FERTILIZANTES (GOIASFERTIL)	OWNER-OPERATOR
COMMODITY	MARKETABILITY
PHOSPHATE	PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

YEAR OF INITIAL PRODUCTION:	1976	-----EXPLORATION METHODS----- MAGNETIC SURVEY/RADIOACTIVITY SURVEY/ CORE DRILLING/TEST PIT
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GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: DISSEMINATED  
 MODE OF ORIGIN: MAGMATIC DIFFERENTIATION  
 SHAPE OF ORE BODY: MASSIVE

MINERALIZED ZONE:	MINIMUM DEPTH: 0 METERS
AVERAGE DEPTH: 5 METERS	
AVERAGE THICKNESS: 250 METERS	

LITHOLOGY:		
NAME OF FORMATION:	CATALAO I COMPLEX	GEOLOGIC AGE: UPPER CRETACEOUS
ROCK TYPE:		
CARBONATITE	IS ORE	

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS
APATITE	PHOSPHATES
SILEXITE	FORMS OF SiO <sub>2</sub>
VERMICULITE	SILICATES
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )
ILMENITE	OXIDES (EXCLUDING SiO <sub>2</sub> )
BARITE	SULFIDES
PYROCHLORE	MULTIPLE OXIDES CONTAINING Nb,Ta,Ti
ANATASE	MULTIPLE OXIDES CONTAINING Nb,Ta,Ti

**MINE/MILL INFORMATION****SURFACE MINING:**

METHOD: OPEN-PIT  
 CAPACITY: 12200  
 AVERAGE COVER THICKNESS: 5 METERS

UNITS: MT ORE/DAY

**TRANSPORTATION (ORE):**

ORIGINATING FACILITY: MINE  
 LATITUDE: S 18 08 00  
 PERCENT SHIPPED: 100  
 METHOD OF TRANSPORTATION: TRUCK  
 DESTINATION FACILITY: MILL (ON-SITE)  
 LATITUDE: S 18 08 00

LOCATION: BRAZIL  
 LONGITUDE: W 47 48 00  
 DISTANCE (KM): 1  
 LOCATION: BRAZIL  
 LONGITUDE: W 47 48 00

**BENEFICIATION:**

METHOD: FLOTATION  
 DESIGN CAPACITY: 12200  
 UNITS: MT ORE/DAY

-----DESCRIPTION OF MILLING-----  
 ORE/CRUSHED/SIZED/GROUND/DESLIMED/FLOTATION/  
 THICKENED/FILTERED/DRYED

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	61	38	WT-PCT

**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY: MILL (ON-SITE)  
 LATITUDE: S 18 08 00  
 PERCENT SHIPPED: 100  
 METHOD OF TRANSPORTATION: RAIL  
 DESTINATION FACILITY: REFINERY

LOCATION: BRAZIL  
 LONGITUDE: W 47 48 00  
 LOCATION: UBERABA, BRAZIL

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 38, NO. 2, 1972, PP. 201-341.

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MC NEIL, M. BRAZIL'S URANIUM/THORIUM DEPOSITS. GEOLOGY, RESERVES AND POTENTIAL. MILLER FREEMAN, SAN FRANCISCO, CALIF., 1978.

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SILVA, A. F., JR, AND R. B. NETO. ANALYSIS OF PHOSPHATE ROCK PRODUCTION IN BRAZIL. JULY, 1979.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: CATALAO-FOSFAGO

SEQUENCE NUMBER: 3510170017

NATION: BRAZIL

SUBDIVISION: GOIAS

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: S 18 DEG 08 MIN 00 SEC

LONGITUDE: W 47 DEG 48 MIN 00 SEC

UTM - ZONE: 23 HEMISPHERE: SOUTHERN

NORTHING: 7992929 EASTING: 203708

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 850 METERS

PRECISION: 500 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING

PRIVATE LEASE

## ALTERNATE NAMES

FOSFAGO

FAZENDA

CHAPADAO AT OUVIDOR

## OWNERSHIP

FOSFAGO DE GOIAS, S A (FOSFAGO)

## STATUS

OWNER-OPERATOR

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

## RECORD 1

MEASURED 73,000,000  
 UNITS MT ORE  
 YEAR/DATA 1978

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	13.5-18	WT-PCT

## RESERVE-RESOURCE - REMARKS

## SOURCE FOR RECORD 1:

SCHREIBER, E. J. AND N. PARKS. BRAZIL'S N-P-K GOALS SLIP BEHIND SCHEDULE. E&MJ, FEBRUARY 1978, PP. 82-85.

DEPOSIT HISTORICAL INFORMATION-----EXPLORATION METHODS-----  
CORE DRILLING

YEAR OF DISCOVERY: 1971

YEAR OF INITIAL PRODUCTION: 1979

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: DISSEMINATED  
 MODE OF ORIGIN: MAGMATIC DIFFERENTIATION  
 SHAPE OF ORE BODY: MASSIVE  
 CONTROLLING FEATURES: IGNEOUS

## MINERALIZED ZONE:

AVERAGE DEPTH: 31 METERS MINIMUM DEPTH: 10 METERS  
 AVERAGE THICKNESS: 33 METERS

## LITHOLOGY:

NAME OF FORMATION: CATALAO COMPLEX GEOLOGIC AGE: CRETACEOUS  
 ROCK TYPE:  
 CARBONATITE IS ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
APATITE	PHOSPHATES
COLLOPHANE	PHOSPHATES
ILMENITE	OXIDES (EXCLUDING SiO <sub>2</sub> )
BARI TE	SULFIDES
LIMONITE	OXIDES (EXCLUDING SiO <sub>2</sub> )
PYROCHLORE	MULTIPLE OXIDES CONT. Nb, Ta, Ti
SILEXITE	FORMS OF SiO <sub>2</sub>

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: OPEN-PIT CAPACITY: 6600 UNITS: MT ORE/DAY  
 AVERAGE COVER THICKNESS: 31 METERS

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE	LOCATION: BRAZIL
LATITUDE: S 18 08 00	LONGITUDE: W 47 48 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: TRUCK	DISTANCE (KM): 2
DESTINATION FACILITY: MILL (ON-SITE)	LOCATION: BRAZIL
LATITUDE: S 18 08 00	LONGITUDE: W 47 48 00

## BENEFICIATION:

METHOD: FLOTATION ----- DESCRIPTION OF MILLING -----  
 DESIGN CAPACITY: 4600 ORE CRUSHED/SIZED/ MAGNETIC SEPARATION/GROUND/  
 UNITS: MT ORE/DAY MAGNETIC SEPARATION/DESLIMING/FLOTATION/THICKENED/  
 PUMPED/THICKENED/FILTERED/DRIED

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	92	38	WT-PCT

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK  
ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: BRAZIL  
LATITUDE: S 16 08 00 LONGITUDE: W 47 48 00  
PERCENT SHIPPED: 100  
METHOD OF TRANSPORTATION: RAIL  
DESTINATION FACILITY: REFINERY LOCATION: UBERABA, BRAZIL

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: ARAXA-ARAFERTIL

SEQUENCE NUMBER: 3510230009

NATION: BRAZIL

SUBDIVISION: MINAS GERAIS

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: S 19 DEG 32 MIN 46 SEC

LONGITUDE: W 46 DEG 53 MIN 49 SEC

UTM - ZONE: 23 HEMISPHERE: SOUTHERN

NORTHING: 7837771 EASTING: 300975

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 935 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
STATE LEASE

## ALTERNATE NAMES

BARREIRO

BARREIRO DE ARAXA

## OWNERSHIP

## STATUS

ARAXA S.A. FERTILIZANTES E PRODUCTOS QUIMICOS(ARAFERTIL)

## OWNER-OPERATOR

COMPANHIA MINERADORA DO PIROCLORE DE ARAXA

OPERATOR

COMPANHIA BRASILEIRA DE METALURGIA MINERACAO

OPERATOR

## COMMODITY

## MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION-----EXPLORATION METHODS-----  
ELABORATE EXPLORATION PROGRAM

YEAR OF DISCOVERY: 1946

YEAR OF INITIAL PRODUCTION: 1977

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: IGNEOUS

MINERALIZED ZONE:

AVERAGE DEPTH: 0 METERS

MINIMUM DEPTH: 0 METERS

LITHOLOGY:

NAME OF FORMATION: ARAXA ALKALINE PIPE

GEOLOGIC AGE:

OLDER THAN TRIASSIC

ROCK TYPE:

CARBONATITE IS ORE; GANGUE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS
APATITE	PHOSPHATES
COLLOPHANE	PHOSPHATES
MAGNETITE	OXIDES (EXCLUDING SiO <sub>2</sub> )
GOETHITE	OXIDES (EXCLUDING SiO <sub>2</sub> )
MONAZITE	PHOSPHATES
ILMENITE	OXIDES (EXCLUDING SiO <sub>2</sub> )
QUARTZ	FORMS OF SiO <sub>2</sub>
PYROCHLORE	MULTIPLE OXIDES CONTAINING NP, TA, TI

**MINE/MILL INFORMATION****SURFACE MINING:**

METHOD: OPEN-PIT  
 CAPACITY: 8500 UNITS: MT ORE/DAY  
 AVERAGE COVER THICKNESS: 0 METERS

**TRANSPORTATION (ORE):**

ORIGINATING FACILITY: MINE	LOCATION: BRAZIL
LATITUDE: S 19 32 46	LONGITUDE: W 46 53 49
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: TRUCK	DISTANCE (KM): 3
DESTINATION FACILITY: MILL (ON-SITE)	LOCATION: BRAZIL
LATITUDE: S 19 32 46	LONGITUDE: W 46 53 49

**BENEFICIATION:**

METHOD: FLOTATION ----- DESCRIPTION OF MILLING -----  
 DESIGN CAPACITY: 8500 ORE/CRUSH/SCREEN/MAGNETIC SEPARATION/GRIND  
 UNITS: MT ORE/DAY CLASSIFY/DESLIME/FLOTATION/THICKEN/FILTER/DRY

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	49	35	WT-PCT

**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY: MILL (ON-SITE)	LOCATION: BRAZIL
LATITUDE: S 19 32 46	LONGITUDE: W 46 53 49
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: TRUCK	
DESTINATION FACILITY: REFINERY	LOCATION: BRAZIL

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: TAFIRA (VALEP)

SEQUENCE NUMBER: 3510230010

NATION: BRAZIL

SUBDIVISION: MINAS GERAIS

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: S 19 DEG 52 MIN 00 SEC

LONGITUDE: W 46 DEG 50 MIN 00 SEC

UTM - ZONE: 23 HEMISPHERE: SOUTHERN

NORTHING: 7802360 EASTING: 308034

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 1200 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
CLAIMS

## ALTERNATE NAMES

VALEP

PILOES

FAZENDA CACHOEIRA

SALITRF

ANTAS

OWNERSHIP  
FOSFERTIL, SASTATUS  
OWNER-OPERATORCOMMODITY  
PHOSPHATEMARKETABILITY  
PRIMARY PRODUCTPUBLISHED RESERVE-RESOURCE INFORMATION

UNDIFFERENTIATED	RECORD 1
UNITS	318,000,000
YEAR/DATA	MT ORE
	1978

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	8.2	WT-PCT

RESERVE-RESOURCES - REMARKS

## SOURCE FOR RECORD 1:

ENGINEERING AND MINING JOURNAL. NEW AND EXPANDING MINES AND PLANTS. OCTOBER 1978, PP. 63.

DEPOSIT HISTORICAL INFORMATION

-----EXPLORATION METHODS-----  
CORE DRILLING/RADIOACTIVITY SURVEY/TRENCHING/  
TEST PITS

YEAR OF DISCOVERY: 1950

YEAR OF INITIAL PRODUCTION: 1979

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

MODE OF ORIGIN: MAGMATIC DIFFERENTIATION  
 SHAPE OF ORE BODY: MASSIVE  
 CONTROLLING FEATURES: IGNEOUS

## MINERALIZED ZONE:

AVERAGE DEPTH: 0 METERS  
 AVERAGE THICKNESS: 60 METERS

MINIMUM DEPTH: 0 METERS

## LITHOLOGY:

NAME OF FORMATION: TAPIRA COMPLEX  
 DEFORMATION DESCRIPTION: INTRUSION  
 ROCK TYPE:  
 CARBONATITE IS ORE  
 PYROXENITE GANGUE

GEOLOGIC AGE: UPPER CRETACEOUS

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
FLUOR-HYDROXY APATITE	PHOSPHATES
ANATASE	MULTIPLE OXIDES CONTAINING NB,TA,TI
VERMICULITE	FORMS OF SiO <sub>2</sub>
PEROVSKITE	MULTIPLE OXIDES CONTAINING NB,TA,TI
MAGNETITE	OXIDES (EXCLUDING SiO <sub>2</sub> )

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: OPEN-PIT  
 CAPACITY: 29900 UNITS: MT ORE/DAY

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE	LOCATION: BRAZIL
LATITUDE: S 19 52 00	LONGITUDE: W 46 50 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: TRUCK	DISTANCE (KM): 4
DESTINATION FACILITY: MILL (ON-SITE)	LOCATION: BRAZIL
LATITUDE: S 19 52 00	LONGITUDE: W 46 50 00

## BENEFICIATION:

METHOD: FLOTATION	-----DESCRIPTION OF MILLING-----
DESIGN CAPACITY: 29900	ORE CRUSHED/SIZED/GROUND/CONDITIONED/DESLIMED/
UNITS: MT ORE/DAY	FLOATED/SHIPPED BY SLURRY PIPELINE

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	54	36	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE)	LOCATION: BRAZIL
LATITUDE: S 19 52 00	LONGITUDE: W 46 50 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: PIPELINE	DISTANCE (KM): 125
DESTINATION FACILITY: REFINERY	LOCATION: UBERABA, BRAZIL

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: PATOS DE MINAS

SEQUENCE NUMBER: 3510230102

NATION: BRAZIL

SUBDIVISION: MINAS GERAIS

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: S 18 DEG 19 MIN 10 SEC

LONGITUDE: W 46 DEG 55 MIN 00 SEC

UTM - ZONE: 23 HEMISPHERE: SOUTHERN

NORTHING: 7973528 EASTING: 297431

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 826 METERS

PRECISION: 500 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING

CLAIMS (ALVARA)

ALTERNATE NAMES

RCCINHA

COROMANDEL

PIRUBINHAS

OWNERSHIP

STATUS

FERTILIZANTES FOSFATADOS, SA (FOSFERTIL) OWNER-OPERATOR

COMMODITY

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3
MEASURED	256,353,000	-----	-----
INDICATED	-----	87,262,000	-----
INFERRRED	-----	-----	110,058,000
UNITS	MT ORE	MT ORE	MT ORE
YEAR/DATA	1976	1976	1976

IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	13.01	WT-PCT
2	P205	10.82	WT-PCT
3	P205	5	WT-PCT

## RESERVE-RESOURCE - REMARKS

SOURCE FOR RECORDS 1, 2, AND 3:

COMPANHIA DE PESQUISA DE RECURSOS MINERAIS, USING ENG ADAMIR G CHAVES, UNIDADE PROTOTIPO INTEGRANTE DO PROJETO FOSFATO DA CPRM: PAMPHLET, 12 PP., MARCH 31, 1976.

DEPOSIT HISTORICAL INFORMATION

## -----EXPLORATION METHODS-----

YEAR OF DISCOVERY: 1974

CORE DRILLING/TRENCHING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED  
 MODE OF ORIGIN: SEDIMENTATION; METAMORPHISM  
 SHAPE OF ORE BODY: LENTICULAR; TABULAR  
 CONTROLLING FEATURES: FAULTING

## MINERALIZED ZONE:

AVERAGE LENGTH: 3000 METERS                    MINIMUM DEPTH: 0 METERS  
 AVERAGE THICKNESS: 35 METERS                    AVERAGE WIDTH: 400 METERS

## LITHOLOGY:

NAME OF FORMATION:	RAMBUI GROUP	GEOLOGIC AGE:	PRECAMBRIAN
ROCK TYPE:			
LIMESTONE	NEAR CRE		
CHERT	NEAR CRE		
PHOSPHORITE	IS ORE		

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
APATITE	PHOSPHATES
WAVELLITE	PHOSPHATES
CARNALLITE	OTHER
MICA	SILICATES
QUARTZ	FORMS OF SiO <sub>2</sub>
CHERT	FORMS OF SiO <sub>2</sub>

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD:	STRIPPING	
CAPACITY:	16000	UNITS: MT ORE/DAY
AVERAGE COVER THICKNESS:	10 METERS	

## TRANSPORTATION (ORE):

ORIGINATING FACILITY:	MINE	LOCATION:	BRAZIL
LATITUDE:	S 18 19 10	LONGITUDE:	W 46 55 00
PERCENT SHIPPED:	100		
METHOD OF TRANSPORTATION:	TRUCK	DISTANCE (KM):	5
DESTINATION FACILITY:	MILL (ON-SITE)	LOCATION:	BRAZIL
LATITUDE:	S 18 19 10	LONGITUDE:	W 46 55 00

## BENEFICIATION:

METHOD:	FLOTATION	----- DESCRIPTION OF MILLING -----
DESIGN CAPACITY:	14000	ORE CRUSHED/SIZED/CLASSIFIED/GROUND/
UNITS:	MT CRE/DAY	DESLIMING/CRIED/REGROUND

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P20 <sup>5</sup>	64	35	WT-PCT

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: BRAZIL

LATITUDE: S 18 19 10

LONGITUDE: W 46 55 00

PERCENT SHIPPED: 100

DESTINATION FACILITY: FOB MILL

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: ARAXA-CAMIG

SEQUENCE NUMBER: 3510230116

NATION: BRAZIL

SUBDIVISION: MINAS GERAIS

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: S 19 DEG 32 MIN 46 SEC

LONGITUDE: W 46 DEG 53 MIN 49 SEC

UTM - ZONE: 23 HEMISPHERE: SOUTHERN

NORTHING: 7837771 EASTING: 300975

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 935 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING

STATE LEASE

OWNERSHIP

STATUS

ARAXA S A FERTILIZANTES E PRODUCTOS QUIMICOS (ARAFERTIL)  
COMPANHIA AGRICOLA DE MINAS GERAIS (CAMIG) (STATE-OWNED)OPERATOR  
OWNER

COMMODITY

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATIONEXPLORATION METHODSYEAR OF DISCOVERY: 1946 ELABORATE EXPLORATION PROGRAM  
YEAR OF INITIAL PRODUCTION: 1976GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: IGNEOUS

MINERALIZED ZONE:

AVERAGE DEPTH: 0 METERS

MINIMUM DEPTH: 0 METERS

LITHOLOGY:

NAME OF FORMATION: ARAXA ALKALINE PIPE GEOLOGIC AGE: OLDER THAN TRIASSIC  
ROCK TYPE:

CARBONATITE IS ORE; GANGUE

MINERALIZATION:

MINERAL NAME

MINERAL CLASS

APATITE PHOSPHATES

COLLOPHANE PHOSPHATES

MAGNETITE OXIDES (EXCLUDING SiO<sub>2</sub>)GOETHITE OXIDES (EXCLUDING SiO<sub>2</sub>)

MONAZITE PHOSPHATES

ILMENITE OXIDES (EXCLUDING SiO<sub>2</sub>)QUARTZ FORMS OF SiO<sub>2</sub>

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: OPEN-PIT

CAPACITY: 3500

AVERAGE COVER THICKNESS: 0 METERS

UNITS: MT ORE/DAY

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE

LOCATION: BRAZIL

LATITUDE: S 19 32 46

LONGITUDE: W 46 53 49

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: TRUCK

DISTANCE (KM): 5

DESTINATION FACILITY: MILL (ON-SITE)

LOCATION: BRAZIL

LATITUDE: S 19 32 46

LONGITUDE: W 46 53 49

## BENEFICIATION:

METHOD: MAGNETIC

## ----- DESCRIPTION OF MILLING -----

DESIGN CAPACITY: 3500

ORE CRUSHED/SIZED/MAGNETIC SEPARATION/

UNITS: MT ORE/DAY

GROUND/CLASSIFIED/DESLIMED/DRIED

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	35	26.25	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: BRAZIL

LATITUDE: S 19 32 46 LONGITUDE: W 46 53 49

METHOD OF TRANSPORTATION: TRUCK DISTANCE (KM): 121

DESTINATION FACILITY: REFINERY LOCATION: UBERABA, BRAZIL

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: OLINDA-PAULISTA/IGARASSU      SEQUENCE NUMBER: 3510270003

NATION: BRAZIL  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: S 07 DEG 45 MIN 00 SEC  
 UTM - ZONE: 25 HEMISPHERE: SOUTHERN  
 POINT OF REFERENCE: ORE BODY

SUBDIVISION: PARAIBA  
 CURRENT STATUS: EXPROLED DEPOSIT  
 LONGITUDE: W 35 DEG 00 MIN 00 SEC  
 NORTHING: 9142874 EASTING: 279423  
 PRECISION: 1 KILOMETER  
 YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
CLAIMS

ALTERNATE NAMES  
 OLINDA-PAULISTA  
 IGARASSU  
 PROJECT FOSFORITA  
 PAULISTA-IGARASAU

OWNERSHIP  
LUNDGREEN GROUP, ET AL (FOSPERSA)STATUS  
OWNER-OPERATORCOMMODITY  
PHOSPHATEMARKETABILITY  
PRIMARY PRODUCTPUBLISHED RESERVE-RESOURCE INFORMATION

RECORD 1  
 INFERRED 50,000,000  
 UNITS MT ORE  
 YEAR/DATA 1977

IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P2C5	18	WT-PCT

## RESERVE-RESOURCE - REMARKS

SOURCE FOR RECORD 1:

ANDREY, PAULO ABIB. BRAZIL'S BUSY PHOSPHATE INDUSTRY - NEW DISCOVERIES, NEW MINES PLANNED. WORLD MINING, FEBRUARY 1977, PP. 47.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 GEOPHYSICAL ANOMALY  
 YEAR OF DISCOVERY: 1951

-----EXPLORATION METHODS-----  
 CORE DRILLING/RADIOACTIVITY SURVEY

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
 MODE OF ORIGIN: SEDIMENTATION  
 SHAPE OF ORE BODY: TABULAR  
 CONTROLLING FEATURES: BEDDING

## MINERALIZED ZONE:

AVERAGE DEPTH: 37 METERS  
 AVERAGE THICKNESS: 1.5 METERS

MINIMUM DEPTH: 4 METERS  
 STRIKE/DIP: NORTH-SOUTH/SLIGHTLY EAST

## LITHOLOGY:

NAME OF FORMATION:	GRAMMAME, BASAL MEMBER	GEOLOGIC AGE:	CRETACEOUS
ROCK TYPE:			
LIMESTONE	LIES OVER ORE		
CLAY	LIES OVER ORE		
PHOSPHORITE	IS ORE		

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
COLLOPHANE	PHOSPHATES
QUARTZ	FORMS OF SiO <sub>2</sub>

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WILLIAMS, H. E. O CLIMA DO BRAZIL. BRAZIL, SERV. GEOL. E MIN., NOTAS PRELIMINARES E ESTUDOS, NUMERO 8, RIO DE JANEIRO, 1937.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: IPANEMA I &amp; II

SEQUENCE NUMBER: 3510430005

NATION: BRAZIL

SUBDIVISION: SAO PAULO

TYPE OF OPERATION: SURFACE

CURRENT STATUS: DEVELOPING DEPOSIT

LATITUDE: S 26 DEG 36 MIN 00 SEC

LONGITUDE: W 47 DEG 35 MIN 00 SEC

UTM - ZONE: 23 HEMISPHERE: SOUTHERN

NORTHING: 7055434 EASTING: 242736

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 900 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
LEASED CLAIMS

ALTERNATE NAMES

IPANEMA COMPLEX

MORRO DE ARAGOAIBA

IPANEMA FEZENDA

OWNERSHIP  
SERRANA, S ASTATUS  
OWNER-OPERATORCOMMODITY  
PHOSPHATEMARKETABILITY  
PRIMARY PRODUCTPUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1920

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: DISSEMINATED

MODE OF ORIGIN: MAGMATIC DIFFERENTIATION

SHAPE OF ORE BODY: MASSIVE

CONTROLLING FEATURES: IGNEOUS

MINERALIZED ZONE:

AVERAGE DEPTH: 0 METERS

AVERAGE THICKNESS: 200 METERS

LITHOLOGY:

NAME OF FORMATION: IPANEMA COMPLEX      GEOLOGIC AGE: CRETACEOUS

ROCK TYPE:

CARBONATITE      IS ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
FLUORAPATITE	PHOSPHATES
MAGNETITE	OXIDES (EXCLUDING SiO <sub>2</sub> )
VERMICULITE	SILICATES
BARITE	SULFIDES
ZIRCON	SILICATES
NEPHELINE SYENITE	SILICATES

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: JACUPIRANGA

SEQUENCE NUMBER: 3510430012

NATION: BRAZIL

SUBDIVISION: SAO PAULO

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: S 24 DEG 42 MIN 00 SEC

LONGITUDE: W 48 DEG 09 MIN 00 SEC

UTM - ZONE: 22 HEMISPHERE: SOUTHERN

NORTHING: 7265427 EASTING: 788369

POINT OF REFERENCE: CRE BODY

PRECISION: 1 KILOMETER

ELEVATION: 30 METERS

PRECISION: 500 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

MORRO DA MINA

## OWNERSHIP

SERRANA SA DE MINERACAO

## STATUS

OWNER-OPERATOR

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATIONEXPLORATION METHODS  
CORE DRILLING

YEAR OF DISCOVERY: 1940

YEAR OF INITIAL PRODUCTION: 1943

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF CRE BODY: DISSEMINATED

MODE OF ORIGIN: MAGMATIC DIFFERENTIATION

SHAPE OF THE BODY: MASSIVE

CONTROLLING FEATURES: IGNEOUS

## MINERALIZED ZONE:

AVERAGE DEPTH: 0 METERS

AVERAGE THICKNESS: 50 METERS

STRIKE/DIP: NORTH-NORTHEAST/NO DIP

## LITHOLOGY:

NAME OF FORMATION: JACUPIRANGA COMPLEX GEOLOGIC AGE: LOWER CRETACEOUS

DEFORMATION DESCRIPTION: INTRUSION

GEOLOGIC AGE: LOWER CRETACEOUS

## ROCK TYPE:

CARBONATITES

IS ORE

PERIODOTITE

IS ORE

PYROXENITE

IS ORE

NEPHELINE SYENITE

IS ORE

GRANODIORITE

ENCLOSES ORE

SCHIST

ENCLOSES ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
APATITE	PHOSPHATES
DOLOMITE	CARBONATES
MAGNETITE	OXIDES (EXCLUDING SiO <sub>2</sub> )
SERPENTINE	SILICATES
BARITE	SULFIDES
CALCITE	CARBONATES
FORSTERITE	SILICATES
PHLOGOPITE	SILICATES
PYRITE	SULFIDES
PYROCHLORE	MULTIPLE OXIDES CONTAINING Nb,Ta,Ti

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: OPEN-PIT  
 CAPACITY: 14500 UNITS: MT ORE/DAY  
 AVERAGE COVER THICKNESS: 0 METERS

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE	LOCATION: BRAZIL
LATITUDE: S 24 42 00	LONGITUDE: W 48 09 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: TRUCK	DISTANCE (KM): 1.2
DESTINATION FACILITY: MILL (ON-SITE)	LOCATION: BRAZIL
LATITUDE: S 24 42 00	LONGITUDE: W 48 09 00

## BENEFICIATION:

METHOD: FLOTATION	----- DESCRIPTION OF MILLING -----
DESIGN CAPACITY: 14500	ORE CRUSHED/SIZED/GROUND/DESLIMED/
UNITS: MT ORE/DAY	CONDITIONED/FLOATED/THICKENED/FILTERED/
	DRIED/LOAD-OUT

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	73	35	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE)	LOCATION: BRAZIL
LATITUDE: S 24 42 00	LONGITUDE: W 48 09 00
PERCENT SHIPPED: 70	
METHOD OF TRANSPORTATION: TRUCK	
DESTINATION FACILITY: REFINERY	LOCATION: BRAZIL

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE)	LOCATION: BRAZIL
LATITUDE: S 24 42 00	LONGITUDE: W 48 09 00
PERCENT SHIPPED: 30	
METHOD OF TRANSPORTATION: TRUCK	DISTANCE (KM): 215
DESTINATION FACILITY: PORT	LOCATION: SAO PAULO

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WORLD MINING. HOW SERRANA MINES AND FLOATS 5.0 PERCENT P205 ORE. JUNE 1977, PP. 42-44.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: ANITAPOLIS

SEQUENCE NUMBER: 3510450002

NATION: BRAZIL

SUBDIVISION: SANTA CATARINA

TYPE OF OPERATION: SURFACE

CURRENT STATUS: DEVELOPING DEPOSIT

LATITUDE: S 27 DEG 48 MIN 30 SEC

LONGITUDE: W 49 DEG 06 MIN 00 SEC

UTM - ZONE: 22 HEMISPHERE: SOUTHERN

NORTHING: 6922751 EASTING: 687165

POINT OF REFERENCE: PLANT

PRECISION: 1 KILOMETER

ELEVATION: 850 METERS

PRECISION: 500 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING

CLAIMS

ALTERNATE NAMES

ALTOS DO RIO PINHEIROS

OWNERSHIP

STATUS

INDUSTRIAS LUCHSINGER MADORIN, SA

OWNER-OPERATOR

FERTISUL, SA

OWNER

PAULO ABIB ENGENHARIA, SA

OWNER

SANTINVEST, SA

OWNER

COMMODITY

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION-----EXPLORATION METHODS-----CORE DRILLING/SUBSURFACE GEOLOGICAL MAPPING/TEST PIT/  
GEOCHEMICAL/RADIOACTIVITY SURVEYGEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: DISSEMINATED

MODE OF ORIGIN: MAGMATIC DIFFERENTIATION

SHAPE OF ORE BODY: DOMELIKE

CONTROLLING FEATURES: IGNEOUS

MINERALIZED ZONE:

AVERAGE DEPTH: 10 METERS

MINIMUM DEPTH: 0.6 METER

UNCONSOLIDATED MATERIAL:

AVERAGE THICKNESS: 30 METERS

LITHOLOGY:

NAME OF FORMATION: ANITAPOLIS COMPLEX GEOLOGIC AGE: UPPER CRETACEOUS

ROCK TYPE:

CARBONATITE IS ORE; GANGUE

PYROXENITE ENCLOSSES ORE

ALKALIC IGNEOUS ENCLOSSES ORE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
APATITE	PHOSPHATES	PHANERITIC-FINE
QUARTZ	FORMS OF SiO <sub>2</sub>	PHANERITIC-FINE
FELDSPAR	SILICATES	PHANERITIC-FINE
PYROXENE	SILICATES	PHANERITIC-FINE
EPIDOTE	SILICATES	PHANERITIC-FINE
BIOTITE	SILICATES	PHANERITIC-FINE
CALCITE	CARBONATE	PHANERITIC-FINE

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CANADALOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: CARGILL	SEQUENCE NUMBER: 1220400088
NATION: CANADA	SUBDIVISION: ONTARIO
TYPE OF OPERATION: SURFACE	CURRENT STATUS: EXPLORED DEPOSIT
LATITUDE: N 49 DEG 18 MIN 00 SEC	LONGITUDE: W 82 DEG 49 MIN 00 SEC
UTM - ZONE: 17 HEMISPHERE: NORTHERN	NORTHING: 5462174 EASTING: 367923
POINT OF REFERENCE: ORE BODY	PRECISION: 1 KILOMETER
ELEVATION: 225 METERS	PRECISION: 100 METERS
DATUM: SEA LEVEL	YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
LOCATED CLAIM

ALTERNATE NAMES  
CARGILL TOWNSHIP

OWNERSHIP	STATUS
CONTINENTAL COPPER MINES LTD.	OWNER
INTERNATIONAL MINERALS & CHEMICAL CORP. (CANADA)	OWNER

COMMODITY	MARKETABILITY
PHOSPHATE	PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

INDICATED	RECORD 1	RECORD 2
UNITS	62,500,000	56,700,000
YEAR/DATA	MT ORE	MT ORE
	1975	1979

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	19.6	WT-PCT
2	P205	20	WT-PCT

PUBLISHED RESERVE-RESOURCE INFORMATION

## SOURCE FOR RECORD 1:

SANDVIK, P. O. & G. ERDOSH. GEOLOGY OF THE CARGILL PHOSPHATE DEPOSIT OF NORTHERN ONTARIO. CIM BULLETIN, JANUARY 1977, PP. 90-96.

## SOURCE FOR RECORD 2:

ANNIS, R. C., D. A. CRANSTONE, AND M. VALLEE. A SURVEY OF KNOWN MINERAL DEPOSITS IN CANADA THAT ARE NOT BEING MINED. ENERGY MINES AND RESOURCES CANADA, MINERALS, MR 181, 1978, PP. A-27.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:	-----EXPLORATION METHODS-----
ORE-MINERAL IN PLACE	CORE DRILLING/MAGNETIC SURVEY
YEAR OF DISCOVERY: 1965	

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: IGNEOUS INTRUSION  
 MODE OF ORIGIN: CONTACT METASOMATIC  
 SHAPE OF ORE BODY: MASSIVE  
 CONTROLLING FEATURES: IGNEOUS

MINERALIZED ZONE:  
 MINIMUM DEPTH: 85 METERS

## LITHOLOGY:

NAME OF FORMATION: CARGILL COMPLEX      GEOLOGIC AGE: PRECAMBRIAN  
 DEFORMATION DESCRIPTION: FAULTING; INTRUSION; MINOR FOLDING  
 RELATIONSHIP TO MINERALIZATION: COMPLEX  
 GEOLOGIC AGE: PRECAMBRIAN

## ROCK TYPE:

CARBONATITE	IS ORE
QUARTZ DICRITE	LIES ALONG ORE; NEAR ORE
PYROXENITE	LIES ALONG ORE; NEAR ORE
CLAY	LIES OVER ORE; NEAR ORE
SAND	LIES OVER ORE; NEAR ORE
GRAVEL	LIES OVER ORE; NEAR ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
APATITE	PHOSPHATES	VARIABLE
VERMICULITE	FORMS OF SiO <sub>2</sub>	VARIABLE
MAGNETITE	OXIDES (EXCLUDING SiO <sub>2</sub> )	VARIABLE

BIBLIOGRAPHY RECORDS

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SANDVIK, P. O. AND G. ERDOSH. GEOLOGY OF THE CARGILL PHOSPHATE DEPOSIT OF NORTHERN ONTARIO. CIM BULLETIN, JANUARY 1977, PP. 90-96.

CHINALOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: FANSHAN SEQUENCE NUMBER: 5700130041

NATION: CHINA

SUBDIVISION: HOPEH

TYPE OF OPERATION: UNDERGROUND

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 39 DEG 42 MIN 00 SEC

LONGITUDE: E 115 DEG 58 MIN 00 SEC

UTM - ZONE: 50 HEMISPHERE: NORTHERN

NORTHING: 4394761 EASTING: 411406

POINT OF REFERENCE: ORE BODY

YEAR OF INFORMATION: 1981

OWNERSHIP

STATUS

MINISTRY OF CHEMICAL INDUSTRIES (GOVT.)

OWNER

COMMODITY

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1977

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

MODE OF ORIGIN: HYDROTHERMAL

CONTROLLING FEATURES: IGNEOUS

LITHOLOGY:

GEOLOGIC AGE: PRECAMBRIAN

ROCK TYPE:

GRANITE

GANGUE

UNSPECIFIED IGNEOUS

IS ORE

MINERALIZATION:

MINERAL NAME MINERAL CLASS

APATITE

PHOSPHATES

BIBLIOGRAPHY RECORDS

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MINING MAGAZINE. CHINESE PHOSPHATE. (NEWS ITEM RE FANSHAN) MAY 1977.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: ZHONGXIAN

SEQUENCE NUMBER: 5700170039

NATION: CHINA

SUBDIVISION: HUPEH

TYPE OF OPERATION: UNDERGROUND

CURRENT STATUS: PRODUCER

LATITUDE: N 31 DEG 11 MIN 00 SEC

LONGITUDE: E 112 DEG 33 MIN 00 SEC

UTM - ZONE: 49 HEMISPHERE: NORTHERN

PRECISION: 5 KILOMETERS

POINT OF REFERENCE: ORE BODY

YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

ZHONGXIANG

CHINGXIANG

## OWNERSHIP

MINISTRY OF CHEMICAL INDUSTRIES (GOVERNMENT)

## STATUS

OWNER-OPERATOR

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

YEAR OF INITIAL PRODUCTION: 1963

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: MASSIVE

MINERALIZED ZONE:

AVERAGE THICKNESS: 1.5 METERS

## LITHOLOGY:

NAME OF FORMATION: DOUSHANTO (TOWSHANTO)

GEOLOGIC AGE:

PRECAMBRIAN

ROCK TYPE:

DOLOMITE NEAR CRE

PHOSPHORITE IS ORE

## MINERALIZATION:

MINERAL NAME

MINERAL CLASS

APATITE PHOSPHATES

DOLOMITE CARBONATES

MINE/MILL INFORMATION

## UNDERGROUND MINING:

METHOD: INCLINED CUT AND FILL  
CAPACITY: 2000 UNITS: MT ORE/DAY

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE LOCATION: CHINA (P. R. OF)  
LATITUDE: N 31 11 00 LONGITUDE: E 112 33 00  
PERCENT SHIPPED: 100  
DESTINATION FACILITY: MILL (ON-SITE) LOCATION: CHINA (P. R. OF)  
LATITUDE: N 31 11 00 LONGITUDE: E 112 33 00

## BENEFICIATION:

METHOD: SIZING ----- DESCRIPTION OF MILLING -----  
DESIGN CAPACITY: 2000 ORE/CRUSH/LOADOUT  
UNITS: MT ORE/DAY

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	85	28	WT-PCT

BIBLIOGRAPHY RECORDS

BRITISH SULPHUR CORP., LTD. WORLD SURVEY OF PHOSPHATE DEPOSITS. 4TH EDITION, LONDON, 1980, PP. 185-190

WANG, K.P. MINERAL RESOURCES AND BASIC INDUSTRIES IN THE PEOPLES' REPUBLIC OF CHINA. WESTVIEW PRESS. BOULDER, COLORADO, 1977, PP. 187-190.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: JINGSHAN

SEQUENCE NUMBER: 5700170040

NATION: CHINA

SUBDIVISION: HUPEH

TYPE OF OPERATION: UNDERGROUND

CURRENT STATUS: PRODUCER

LATITUDE: N 31 DEG 02 MIN 00 SEC

LONGITUDE: E 113 DEG 05 MIN 00 SEC

UTM - ZONE: 49 HEMISPHERE: NORTHERN

NORTHING: 3434976 EASTING: 698843

POINT OF REFERENCE: ORE BODY

PRECISION: 5 KILOMETERS

YEAR OF INFORMATION: 1981

ALTERNATE NAMES

JINGSHAN

OWNERSHIP

MINISTRY OF CHEMICAL INDUSTRIES (GOVERNMENT)

STATUS

OWNER-OPERATOR

COMMODITY

PHOSPHATE

MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

YEAR OF INITIAL PRODUCTION: 1965

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: MASSIVE

MINERALIZED ZONE:

AVERAGE THICKNESS: 1.5 METERS

LITHOLOGY:

NAME OF FORMATION: COUSHANTO (TOWSHANTO)

GEOLOGIC AGE: PRECAMBRIAN

ROCK TYPE:

DOLOMITE NEAR ORE

PHOSPHORITE IS ORE

MINERALIZATION:

MINERAL NAME

MINERAL CLASS

FLUORAPATITE

PHOSPHATES

DOLOMITE

CARBONATES

MINE/MILL INFORMATION

UNDERGROUND MINING:

METHOD: INCLINED CUT AND FILL

CAPACITY: 1300

UNITS: MT ORE/DAY

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE	LOCATION: CHINA (P. R. OF)
LATITUDE: N 31 02 00	LONGITUDE: E 113 05 00
PERCENT SHIPPED: 100	
DESTINATION FACILITY: MILL (ON-SITE)	LOCATION: CHINA (P. R. OF)
LATITUDE: N 31 02 00	LONGITUDE: E 113 05 00

## BENEFICIATION:

METHOD: SIZING	----- DESCRIPTION OF MILLING -----
DESIGN CAPACITY: 1300	ORE/CRUSH/LOADOUT
UNITS: MT ORE/DAY	

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	85	28	WT-PCT

BIBLIOGRAPHY RECORDS

BRITISH SULPHUR CORP., LTD. WORLD SURVEY OF PHOSPHATE DEPOSITS. 4TH EDITION, LONDON, 1980, PP. 185-190.

WANG, K. P. MINERAL RESOURCES AND BASIC INDUSTRIES IN THE PEOPLES' REPUBLIC OF CHINA. WESTVIEW PRESS, BOULDER COLORADO, 1977, PP. 187-190.

YEH, LIEN-TSUN, SUN SHU, AND CHIN QI-YAND. UNDATED AND CHARACTERISTICS OF LITHOLOGIC ASSOCIATIONS OF LATE SINIAN AND EARLY CAMBRIAN PHOSPHORITES IN EASTERN CHINA. (SOURCE UNKNOWN- AUTHORS ASSOCIATED WITH INST. GEOL. ACADEMICA SONICA, BEIJING, CHINA). 14 PP. PLUS ILLUS.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: GAIYANG

SEQUENCE NUMBER: 5700330035

NATION: CHINA

SUBDIVISION: KWEICHOW

TYPE OF OPERATION: UNDERGROUND

CURRENT STATUS: PRODUCER

LATITUDE: N 26 DEG 58 MIN 00 SEC

LONGITUDE: E 106 DEG 40 MIN 00 SEC

UTM - ZONE: 48 HEMISPHERE: NORTHERN

NORTHING: 2983667 EASTING: 665424

POINT OF REFERENCE: ORE BODY

PRECISION: 5 KILOMETERS

ELEVATION: 1500 METERS

PRECISION: 500 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

OWNERSHIP

STATUS

MINISTRY OF CHEMICAL INDUSTRIES (GOVERNMENT)

OWNER-OPERATOR

COMMODITY

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

YEAR OF INITIAL PRODUCTION: 1964

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: MASSIVE

LITHOLOGY:

NAME OF FORMATION: COUSHANTO (TOWSHANTO)

GEOLOGIC AGE: PRECAMBRIAN

ROCK TYPE:

MUDSTONE ENCLOSSES ORE

SHALE ENCLOSSES ORE

DOLOMITE NEAR ORE; ENCLOSSES ORE

PHOSPHORITE IS ORE

MINERALIZATION:

MINERAL NAME

MINERAL CLASS

FLUORAPATITE

PHOSPHATES

DOLOMITE

CARBONATES

MINE/MILL INFORMATION

UNDERGROUND MINING:

METHOD: INCLINED CUT AND FILL

UNITS: MT ORE/DAY

CAPACITY: 6500

TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE

LOCATION: CHINA (P. R. OF)

LATITUDE: N 26 58 00

LONGITUDE: E 106 40 00

PERCENT SHIPPED: 100

DESTINATION FACILITY: MILL (ON-SITE)

LOCATION: CHINA (P. R. OF)

LATITUDE: N 26 58 00

LONGITUDE: E 106 40 00

## BENEFICIATION:

METHOD: SIZING  
 DESIGN CAPACITY: 6500  
 UNITS: MT ORE/DAY

----- DESCRIPTION OF MILLING -----  
 ORE/CRUSH/LOADOUT

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	85	35	WT-PCT

BIBLIOGRAPHY RECORDS

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LEE, ANNABELLE I.N., ED. FERTILIZER OCCURRENCES IN THE ASIA-PACIFIC REGION. EAST-WEST RESOURCE SYSTEMS INSTITUTE HONOLULU, HAWAII, 1980, PP. 106, 129-135.

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LOCATION AND GENERAL DEPOSIT INFORMATION

SEQUENCE NUMBER: 5700330036

NATION: CHINA  
TYPE OF OPERATION: SURFACE-UNDERGROUND  
LATITUDE: N 26 DEG 35 MIN 00 SEC  
UTM - ZONE: 48 HEMISPHERE: NORTHERN  
POINT OF REFERENCE: ORE BODY  
ELEVATION: 1500 METERS  
DATUM: SEA LEVEL

SUBDIVISION: KWEICHOW  
CURRENT STATUS: DEVELOPING DEPOSIT  
LONGITUDE: E 107 DEG 27 MIN 00 SFC  
NORTHING: 2942457 EASTING: 744016  
PRECISION: 10 KILOMETERS  
PRECISION: 500 METERS  
YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

FUGUAN

**OWNERSHIP**  
MINISTRY OF CHEMICAL INDUSTRIES (GOVERNMENT)

STATUS  
OWNER

**COMMODITY** **MARKETABILITY**  
**PHOSPHATE** **PRIMARY PRODUCT**

RECORD 1  
900,000,000  
MT ORE  
1978

PUBLISHED RESERVE-RESOURCE INFORMATION

RECORD 1: RF SERVE GRADE RANGE REPORTED: 25 TO 30 PERCENT P205.

SOURCE FOR RECORD 1:

NEW CHINA NEWS AGENCY. NEWS ITEM, RE-PHOSPHATE DEPOSIT AT FUZHUA. MARCH 18, 1978.

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1976

## GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
MODE OF ORIGIN: SEDIMENTATION  
SHAPE OF ORE BODY: MASSIVE

## LITHOLOGY:

NAME OF FORMATION: DOUSHANTO (TOWSHANTO) GEOLOGIC AGE: PRECAMBRIAN

**FOOT TYPE:**

SHALE ENCLOSES OR

DOLOMITE NEAR ORE; ENCLOSSES CRE

**PHOSPHORITE IS ONE**

MINERALIZATION:

MINERAL NAME  
FLUORAPATITE  
DOLOMITE

MINERAL CLASS  
PHOSPHATES  
CARBONATES

BIBLIOGRAPHY RECORDS

MEW, M. C., ED. WORLD SURVEY OF PHOSPHATE DEPOSITS. BRITISH SULPHUR CORP. LTD. 4TH EDITION, LONDON, 1980, PP. 185-190.

NEW CHINA NEWS AGENCY. NEWS ITEM, RE-PHOSPHATE DEPOSIT AT FUZHUAN. MARCH 18, 1978.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SHANDONG

SEQUENCE NUMBER: 5700450024

NATION: CHINA

SUBDIVISION: SHANTUNG

TYPE OF OPERATION: UNDERGROUND

CURRENT STATUS: PRODUCER

LATITUDE: N 36 DEG 00 MIN 00 SEC

LONGITUDE: E 118 DEG 00 MIN 00 SEC

UTM - ZONE: 50 HEMISPHERE: NORTHERN

NORTHING: 3984210 EASTING: 590131

POINT OF REFERENCE: ORE BODY

PRECISION: 10 KILOMETERS

YEAR OF INFORMATION: 1981

ALTERNATE NAMES:

SHANDONG

SHANTUNG PROVINCE

SHANDONG PROVINCE

OWNERSHIP

STATUS

MINISTRY OF CHEMICAL INDUSTRIES (GOVERNMENT)

OWNER-OPERATOR

COMMODITY

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

-----EXPLORATION METHODS-----  
 TEST PIT

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSITS

MINERALIZED ZONE:

AVERAGE DEPTH: 2 METERS

MINIMUM DEPTH: 1 METER

AVERAGE THICKNESS: 1 METER

LITHOLOGY:

GEOLOGIC AGE: PRECAMBRIAN

ROCK TYPE:

UNSPECIFIED IGNEOUS

IS ORE

MINERALIZATION:

MINERAL NAME

MINERAL CLASS

APATITE

PHOSPHATES

MINE/MILL INFORMATION

UNDERGROUND MINING:

METHOD: INCLINED CUT AND FILL

CAPACITY: 6500

UNITS: MT ORE/DAY

ROCK/MINE SUPPORT: TIMBER

## TRANSPORTATION (ORE):

ORIGINATING FACILITY:	MINE	LOCATION:	CHINA (P. R. OF)
LATITUDE:	N 36 00 00	LONGITUDE:	E 118 00 00
METHOD OF TRANSPORTATION:	CARTS	PERCENT SHIPPED:	100
DESTINATION FACILITY:	MILL (ON-SITE)	LOCATION:	CHINA (P. R. OF)
LATITUDE:	N 36 00 00	LONGITUDE:	E 118 00 00

## BENEFICIATION:

METHOD:	SIZING	-----DESCRIPTION OF MILLING-----
DESIGN CAPACITY:	6500	ORE/CRUSH/LOADOUT
UNITS:	MT ORE/DAY	

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	90	28.0	WT-PCT

BIBLIOGRAPHY RECORDS

BRITISH SULFUR CORP., LTD. WORLD SURVEY OF PHOSPHATE DEPOSITS. 4TH ED.  
M.C. MEW, EDITOR. LONDON, 1980, PP. 185-190.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: EMEI

SEQUENCE NUMBER: 5700510041

NATION: CHINA

SUBDIVISION: SZECHUAN

TYPE OF OPERATION: UNKNOWN

CURRENT STATUS: PRODUCER

LATITUDE: N 29 DEG 36 MIN 00 SEC

LONGITUDE: E 103 DEG 31 MIN 00 SEC

UTM - ZONE: 48 HEMISPHERE: NORTHERN

NORTHING: 3275203 EASTING: 356354

POINT OF REFERENCE: ORE BODY

PRECISION: 10 KILOMETERS

YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

EMEI

## OWNERSHIP

MINISTRY OF CHEMICAL INDUSTRIES (GOVERNMENT)

## STATUS

OWNER

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: MASSIVE

MINERALIZED ZONE:

AVERAGE THICKNESS: 5 METERS

## LITHOLOGY:

NAME OF FORMATION: LEI-PO SUITE

GEOLOGIC AGE: LOWER CAMBRIAN

ROCK TYPE:

CHERT

NEAR ORE; GANGUE

LIMESTONE

NEAR ORE; GANGUE

DOLOMITE

NEAR ORE; GANGUE

SANDSTONE

LIES UNDER ORE

DOLOMITE

LIES UNDER ORE

SHALE

NEAR ORE

PHOSPHORITE

IS ORE

MINE/MILL INFORMATION

## REFINERIAZION:

METHOD: SIZING

----- DESCRIPTION OF MILLING -----

PRODUCT

ORE/CRUSH/LOADOUT

PHOSPHATE ROCK

BIBLIOGRAPHY RECORDS

LEE, ANNABELLE I.N., ED. FERTILIZER OCCURENCES IN THE ASIA-PACIFIC REGION. EAST-WEST RESOURCE SYSTEMS INSTITUTE. HONOLULU, HAWAII, 1980, PP. 106, 129-135.

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: JIN-HC

SEQUENCE NUMBER: 5700510042

NATION: CHINA

SUBDIVISION: SZECHUAN

TYPE OF OPERATION: UNKNOWN

CURRENT STATUS: PRODUCER

LATITUDE: N 29 DEG 10 MIN 00 SEC

LONGITUDE: E 103 DEG 20 MIN 00 SEC

UTM - ZONE: 48 HEMISPHERE: NORTHERN

NORTHING: 3227423 EASTING: 337912

POINT OF REFERENCE: TOWN

PRECISION: 10 KILOMETERS

ELEVATION: 2000 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

## OWNERSHIP

## STATUS

MINISTRY OF CHEMICAL INDUSTRIES (GOVT.)

OWNER-OPERATOR

## COMMUNITY

## MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: MASSIVE

CONTROLLING FEATURES: REDDING

## MINERALIZED ZONE:

AVERAGE THICKNESS: 5 METERS

## LITHOLOGY:

NAME OF FORMATION: LEI-PO SUITE

GEOLOGIC AGE: CAMBRIAN

## ROCK TYPE:

CHERT

NEAR ORE; GANGUE

LIMESTONE

NEAR ORE; GANGUE

DOLOMITE

NEAR ORE; GANGUE

SANDSTONE

LIES UNDER ORE

CALCITE

LIES UNDER ORE

SHALE

NEAR ORE

PHOSPHORITE

IS ORE

MINE/MILL INFORMATION

## ENRICHMENT:

METHOD: SIZING

----- DESCRIPTION OF MILLING -----  
ORE/CRUSH/LOADOUT

BIBLIOGRAPHY RECORDS

BRITISH SULPHUR CORP. LTD. WORLD SURVEY OF PHOSPHATE DEPOSITS. 4TH EDITION. LONDON, 1980, PP. 185-190.

LEE, ANNABELLE I.N., ED. FERTILIZER OCCURENCES IN THE ASIA-PACIFIC REGION. EAST-WEST RESOURCE SYSTEMS INSTITUTE. HONOLULU, HAWAII, 1980, PP. 106, 129-135.

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: JINGBING

SEQUENCE NUMBER: 5700510043

NATION: CHINA

SUBDIVISION: SZECHUAN

TYPE OF OPERATION: UNKNOWN

CURRENT STATUS: PRODUCER

LATITUDE: N 28 DEG 19 MIN 00 SEC

LONGITUDE: E 103 DEG 21 MIN 00 SEC

UTM - ZONE: 48 HEMISPHERE: NORTHERN

NORTHING: 3133214 EASTING: 338229

POINT OF REFERENCE: (ORE BODY)

YEAR OF INFORMATION: 1981

OWNERSHIP

MINISTRY OF CHEMICAL INDUSTRIES (GOVT.)

STATUS

OWNER-OPERATOR

COMMODITY

PHOSPHATE

MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

SHAPE OF ORE BODY: MASSIVE

MODE OF ORIGIN: SEDIMENTATION

MINERALIZED ZONE:

AVERAGE THICKNESS: 5 METERS

LITHOLOGY:

NAME OF FORMATION: LEI-PO SUITE                    GEOLOGIC AGE: LOWER CAMBRIAN

ROCK TYPE:

CHERT    NEAR ORE; GANGUE

LIMESTONE    NEAR ORE; GANGUE

DOLOMITE    NEAR ORE; GANGUE

SANDSTONE    LIES UNDER ORE

DOLOMITE    LIES UNDER ORE

SHALE    NEAR ORE

PHOSPHORITE                                        IS ORE

BIBLIOGRAPHY RECORDS

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 EAST-WEST RESOURCE SYSTEMS INSTITUTE. HONOLULU, HAWAII, 1980, PP.  
 185-190.

MEW, M. C. ED. WORLD SURVEY OF PHOSPHATE DEPOSITS. BRITISH SULFUR  
 CORP., LTD., 4TH ED., LONDON, 1980, PP. 106, 129-135.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: GUNYANG

SEQUENCE NUMBER: 5700570069

NATION: CHINA

SUBDIVISION: YUNNAN

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 24 DEG 30 MIN 00 SEC

LONGITUDE: E 102 DEG 35 MIN 00 SEC

UTM - ZONE: 48 HEMISPHERE: NORTHERN

NORTHING: 2711572 EASTING: 255105

POINT OF REFERENCE: ORE BODY

PRECISION: 5 KILOMETERS

ELEVATION: 2300 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

KUNYAN

JINNING

## OWNERSHIP

MINISTRY OF CHEMICAL INDUSTRIES (GOVERNMENT)

## STATUS

OWNER

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1934

YEAR OF INITIAL PRODUCTION: 1966

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: MASSIVE

MINERALIZED ZONE:

AVERAGE LENGTH: 7000 METERS

AVERAGE WIDTH: 1200 METERS

## LITHOLOGY:

NAME OF FORMATION: LEI-PO SUITE

GEOLOGIC AGE: LOWER CAMBRIAN

ROCK TYPE:

PHOSPHORITE IS ORE

DOLOMITE NEAR ORE; GANGUE

SANDSTONE LIES UNDER ORE

DOLOMITE LIES UNDER ORE

SHALE NEAR ORE

## MINERALIZATION:

MINERAL NAME

MINERAL CLASS

DOLOMITE CARBONATES

FLUORAPATITE PHOSPHATES

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: OPEN-PIT  
CAPACITY: 4800

UNITS: MT ORE/DAY

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE  
LATITUDE: N 24 30 00  
PERCENT SHIPPED: 100  
METHOD OF TRANSPORTATION: TRUCK  
DESTINATION FACILITY: MILL (ON-SITE)  
LATITUDE: N 24 30 00

LOCATION: CHINA (P. R. OF)  
LONGITUDE: E 102 35 00  
LOCATION: CHINA (P. R. OF)  
LONGITUDE: E 102 35 00

## BENEFICIATION:

METHOD: SIZING  
DESIGN CAPACITY: 4800  
UNITS: MT ORE/DAY

----- DESCRIPTION OF MILLING -----  
ORE/CRUSH/LOADOUT

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	85	34	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: CHINA (P. R. OF)  
LATITUDE: N 24 30 00 LONGITUDE: E 102 35 00  
PERCENT SHIPPED: 100  
METHOD OF TRANSPORTATION: CONVEYOR, RAIL  
DESTINATION FACILITY: MARKET LOCATION: CHINA (P. R. OF)

BIBLIOGRAPHY RECORDS

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CHEN, THEODORE H.E. CHINA PP. 390 D, E, G. IN: WORLD BOOK ENCYCLOPEDIA. VOL. 3, 1975.

LI, TA MO, AND K. P. WANG. MINING PHOSPHATES IN YUNNAN - POTENTIAL IS GREAT, BUT SO ARE PROBLEMS. MIN. ENG., MARCH 1980, PP. 287 - 288.

PHOSPHORUS AND POTASSIUM. PEOPLES' REPUBLIC OF CHINA. (NEWS ITEM, RE KUNMING) NO. 107. BRITISH SULPHUR CORP., LTD. 1980.

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: GUNMING

SEQUENCE NUMBER: 5700570070

NATION: CHINA

SUBDIVISION: YUNNAN

TYPE OF OPERATION: SURFACE

CURRENT STATUS: DEVELOPING DEPOSIT

LATITUDE: N 24 DEG 55 MIN 00 SEC

LONGITUDE: E 102 DEG 35 MIN 00 SEC

UTM - ZONE: 48 HEMISPHERE: NORTHERN

NORTHING: 2757732 EASTING: 255919

POINT OF REFERENCE: ORE BODY

PRECISION: 5 KILOMETERS

ELEVATION: 2300 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

HAIKOW DEPOSIT

## OWNERSHIP

## STATUS

MINISTRY OF CHEMICAL INDUSTRIES (GOVERNMENT)

OWNER

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: MASSIVE

CONTROLLING FEATURES: FOLDING

## MINERALIZED ZONE:

AVERAGE DEPTH: 50 METERS

MINIMUM DEPTH: 0 METERS

AVERAGE LENGTH: 2400 METERS

AVERAGE WIDTH: 1600 METERS

## LITHOLOGY:

NAME OF FORMATION: LEI-PO SUITE

GEOLOGIC AGE: LOWER CAMBRIAN

## ROCK TYPE:

PHOSPHORITE IS ORE

DOLOMYTE NEAR ORE; GANGUE

SANDSTONE LIES UNDER ORE

DOLOMITE LIES UNDER ORE

SHALE NEAR ORE

## MINERALIZATION:

MINERAL NAME

MINERAL CLASS

FLUORAPATITE PHOSPHATES

DOLOMITE CARBONATES

BIBLIOGRAPHY RECORDS

BRITISH SULPHUR CORP., LTD. WORLD SURVEY OF PHOSPHATE DEPOSITS. 4TH EDITION. LONDON, 1980, PP. 185-190. M.C. MEW, ED.

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SILVA, A. F., JR. BENEFICIATION PROCESS AND ECONOMICS OF THE USE OF LOW GRADE PHOSPHATE ROCK. PAULO ABIB CORP. SAO PAULO, BRAZIL, 1980, 18 P., 4 FIG.

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COLUMBIA

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: PESCA SEQUENCE NUMBER: 3010110001  
NATION: COLOMBIA SUBDIVISION: BOYACA  
TYPE OF OPERATION: UNDERGROUND CURRENT STATUS: PRODUCER  
LATITUDE: S 05 DEG 38 MIN 00 SEC LONGITUDE: W 73 DEG 05 MIN 00 SEC  
UTM - ZONE: 18 HEMISPHERE: SOUTHERN NORTHING: 9377018 EASTING: 712295  
POINT OF REFERENCE: ORE BODY PRECISION: 5 KILOMETERS  
ELEVATION: 2600 METERS PRECISION: 500 METERS  
DATUM: SEA LEVEL YEAR OF INFORMATION: 1981

ALTERNATE NAMES  
CONEJERA MINE  
OCVIDENTE-RIO PESC

OWNERSHIP  
GOVT. OF COLOMBIA (ECOMINAS)

STATUS  
OWNER

**COMMODITY  
PHOSPHATE**

## MARKETABILITY PRIMARY PRODUCT

PUBLISHED-RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2
MEASURED	-----	22,800,000
INDICATED	-----	21,800,000
INFERRRED	250,000,000	75,500,000
UNITS	MT ORE	MT ORE
YEAR/DATA	1977	1978

**RESERVE-RESOURCE - REMARKS**

RECORD 1: ASSAY GRADE NOT AVAILABLE.  
RECORD 2: ASSAY GRADE RANGES FROM 8 TO 25 PERCENT P205.

SOURCE FOR RECORD 1:

GOMEZ, ALEFRITO. ESTUDIO DEL SECTOR FERTILIZANTES EN EL GRUPO  
ANDINO. REPORTE PRELIMINAR: 1977.

SOURCE FOR RECORD 2;

MOJICA, G., E. PEDRO. FOSFATOS. IN: RECURSOS MINERALES DE COLOMBIA. PUBLICACIONES GEOLOGICAS ESPECIALES DEL INGEMINAS.

## DEPOSIT HISTORICAL INFORMATION

# ----- EXPLORATION METHODS -----

## CORE DRILLING

YEAR OF DISCOVERY: 1958  
YEAR OF INITIAL PRODUCTION: 1981

## GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

MODE OF ORIGIN: SEDIMENTATION  
SHAPE OF ORE BODY: TABULAR

**MINERALIZED ZONE:**

MINIMUM DEPTH: 200 METERS AVERAGE THICKNESS: 2.5 METERS  
STRIKE/DIP: N90E/18S

### LITHOLOGY:

NAME OF FORMATION: PLAENERS FORMATION GEOLOGIC AGE: UPPER CRETACEOUS  
DEFORMATION DESCRIPTION: FOLDING

**ROCK TYPE:**

SANDSTONE LIES OVER ORE; LIES UNDER ORE  
PHOSPHORITE IS ORE  
CLAY LIES UNDER ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
COLLOPHANE	PHOSPHATES	
QUARTZ	SILICATES	
FELDSPAR	SILICATES	PHANERITIC-FINE
MUSCOVITE	SILICATES	PHANERITIC-FINE

## MINE/MILL INFORMATION

## UNDERGROUND MINING:

METHOD: ROOM AND PILLAR  
CAPACITY: 450

UNITS: MT ORE/DAY

## TRANSPORTATION (CORE):

ORIGINATING FACILITY: MINE LOCATION: PESCA MINE, BOYACA  
LATITUDE: S 05 38 00 LONGITUDE: W 73 05 00  
PERCENT SHIPPED: 100  
METHOD OF TRANSPORTATION: TRUCK  
DESTINATION FACILITY: MILL (ON-SITE) LOCATION: PESCA MILL, BOYACA  
LATITUDE: S 05 38 00 LONGITUDE: W 73 05 00

## BENEFICIATION:

METHOD: FLOTATION ----- DESCRIPTION OF MILLING -----  
DESIGN CAPACITY: 450 ORE/CRUSH/SIZE/WASH/GRIND/DESLIME/FLOTATION/  
UNITS: MT ORE/DAY FILTER/DRY

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE	GRADE	UNIT
PHOSPHATE ROCK	P205	80	26		WT-PCt

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EGYPTLOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: HAMRAWEIN	SEQUENCE NUMBER: 7290000003
NATION: EGYPT	SUBDIVISION: NOT SUBDIVIDED
TYPE OF OPERATION: UNDERGROUND	CURRENT STATUS: PRODUCER
LATITUDE: N 26 DEG 16 MIN 00 SEC	LONGITUDE: E 33 DEG 57 MIN 00 SEC
UTM - ZONE: 36	NORTHING: 2905400 EASTING: 594862
HEMISPHERE: NORTHERN	PRECISION: 1 KILOMETER
POINT OF REFERENCE: ORE BODY	PRECISION: 100 METERS
ELEVATION: 500 METERS	YEAR OF INFORMATION: 1981
DATUM: SEA LEVEL	
OWNERSHIP MISR PHOSPHATE CO.	STATUS OWNER-OPERATOR
COMMODITY PHOSPHATE	MARKETABILITY PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

INFERRRED	RECORD 1
UNITS	400,000,000
YEAR/DATA	MT ORE
	1977

## RESERVE-RESOURCE - REMARKS

SOURCE FOR RECORD 1:  
MINING MAGAZINE. AUGUST 1977, P. 147.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
ORE-MINERAL IN PLACE  
YEAR OF DISCOVERY: 1964  
YEAR OF INITIAL PRODUCTION: 1978

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
MODE OF ORIGIN: SEDIMENTATION  
SHAPE OF ORE BODY: LENTICULAR  
CONTROLLING FEATURES: FAULTING

MINERALIZED ZONE:  
AVERAGE THICKNESS: 2.5 METERS

**LITHOLOGY:**

NAME OF FORMATION: BEDS OF MAASTRICHTIAN AGE  
 GEOLOGIC AGE: UPPER CRETACEOUS  
 DEFORMATION DESCRIPTION: MAJOR FAULTING  
 RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDED-DURING DEFORMATION

**ROCK TYPE:**

LIMESTONE	LIES OVER ORE; LIES UNDER ORE
SHALE	LIES ALONG ORE
PHOSPHORITE	IS ORE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS
COLLOPHANE	PHOSPHATES
CALCITE	CARBONATES
KAGLINITE	SILICATES

MINE/MILL INFORMATION**UNDERGROUND MINING:**

METHOD: ROOM AND FILLAR	UNITS: MT ORE/DAY
CAPACITY: 900	AVERAGE DEPTH: 140 METERS
SHAFTS - NUMBER: 10	

**TRANSPORTATION (ORE):**

ORIGINATING FACILITY: MINE	LOCATION: EGYPT
LATITUDE: N 26 16 00	LONGITUDE: E 33 57 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: RAIL	DISTANCE (KM): 15.5
DESTINATION FACILITY: MILL (OFF-SITE)	LOCATION: EGYPT

**PENEFICIATION:**

METHOD: PYROMETALLURGY UNSPECIFIED	----- DESCRIPTION OF MILLING -----
DESIGN CAPACITY: 900	ORE/CRUSH/SIZE/WASH/CALCINE/WASH/
UNITS: MT GRE/DAY	DRY/SHIP

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	66	33	WT-PCT

**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY: MILL (OFF-SITE)	LOCATION: EGYPT
PERCENT SHIPPED: 100	
DESTINATION FACILITY: PORT	LOCATION: EGYPT

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WORLD MINING. CATALOG AND DIRECTORY #1980. 1980.

STANFORD RESEARCH INSTITUTE. CHEMICAL ECONOMICS HANDBOOK - PHOSPHATE  
ROCK. MARCH, 1980.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: QUSEIR

SEQUENCE NUMBER: 7290000004

NATION: EGYPT

SUBDIVISION: NOT SUBDIVIDED

TYPE OF OPERATION: UNDERGROUND

CURRENT STATUS: PRODUCER

LATITUDE: N 36 DEG 10 MIN 00 SEC

LONGITUDE: E 34 DEG 20 MIN 00 SEC

UTM - ZONE: 36 HEMISPHERE: NORTHERN

NORTHING: 2894661 EASTING: 633257

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

YEAR OF INFORMATION: 1981

OWNERSHIP

STATUS

RED SEA PHOSPHATE CO.

OWNER-OPERATOR

COMMODITY

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

INDICATED	RECORD 1
UNITS	60,000,000
YEAR/DATA	MT ORE
	1980

IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	25	WT-PCT

RESERVE-RESOURCE - REMARKS

SOURCE FOR RECORD 1:

STANFORD RESEARCH INSTITUTE. CHEMICAL ECONOMICS HANDBOOK -  
PHOSPHATE ROCK. MARCH 1980.DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

ORE-MINERAL IN PLACE

YEAR OF DISCOVERY: 1900

GEOLOGICAL AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

CONTROLLING FEATURES: IGNEOUS

MINERALIZED ZONE:

AVERAGE THICKNESS: 12.5 METERS

LITHOLOGY:

NAME OF FORMATION: DUWI FORMATION GEOLOGIC AGE: UPPER CRETACEOUS

RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

ROCK TYPE:

LIMESTONE LIES OVER ORE; LIES UNDER ORE

PHOSPHORITE IS ORE

CLAY LIES OVER ORE; LIES UNDER ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
COLLOPHANE	PHOSPHATES
CALCITE	CARBONATES
FLINT	FORMS OF SiO <sub>2</sub>
GYPSUM	SULFATES & CHROMATES

MINE/MILL INFORMATION

## UNDERGROUND MINING:

METHOD: ROOM AND PILLAR

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE	LOCATION: EGYPT
LATITUDE: N 26 10 00	LONGITUDE: E 34 20 00
PERCENT SHIPPED: 100	
DESTINATION FACILITY: MILL (ON-SITE)	LOCATION: EGYPT
LATITUDE: N 26 10 00	LONGITUDE: E 34 20 00

## BENEFICIATION:

METHOD: WASHING	----- DESCRIPTION OF MILLING -----
	WASH/AGITATE/TROMMEL/RAKE CLASSIFY

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	70	29.86	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE)	LOCATION: EGYPT
LATITUDE: N 26 10 00	LONGITUDE: E 34 20 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: RAIL	
DESTINATION FACILITY: PORT	LOCATION: QUSEIR,EGYPT

BIBLIOGRAPHY RECORDS

BRITISH SULPHUR CORP., LTD. WORLD SURVEY OF PHOSPHATE DEPOSITS. 4TH EDITION, 1980.

STANFORD RESEARCH INSTITUTE. CHEMICAL ECONOMICS HANDBOOK-PHOSPHATE ROCK. MARCH 1980.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SAFAGA

SEQUENCE NUMBER: 7290000005

NATION: EGYPT

SUBDIVISION: NOT SUBDIVIDED

TYPE OF OPERATION: UNDERGROUND

CURRENT STATUS: PRODUCER

LATITUDE: N 26 DEG 33 MIN 00 SEC

LONGITUDE: E 33 DEG 55 MIN 00 SEC

UTM - ZONE: 36 HEMISPHERE: NORTHERN

NORTHING: 2936756 EASTING: 591310

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 220 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

UM EL HUETAT-GASUS-WASIF-MOHAMMAD RABAH

## OWNERSHIP

RED SEA PHOSPHATE COMPANY

## STATUS

OWNER-OPERATOR

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

## -----EXPLORATION METHODS-----

ORE-MINERAL IN PLACE

TRENCHING

YEAR OF DISCOVERY: 1908

YEAR OF INITIAL PRODUCTION: 1911

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: BASIN

CONTROLLING FEATURES: FAULTING

## MINERALIZED ZONE:

AVERAGE DEPTH: 140 METERS

MINIMUM DEPTH: 0 METERS

AVERAGE THICKNESS: 19.1 METERS

## LITHOLOGY:

NAME OF FORMATION: NUBIAN SANDSTONE GEOLOGIC AGE: UPPER CRETACEOUS

DEFORMATION DESCRIPTION: FAULTING; MINOR FOLDING

RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

## ROCK TYPE:

SANDSTONE LIES UNDER ORE

LIMESTONE LIES OVER ORE

PHOSPHORITE IS ORE

CHERT LIES OVER ORE; LIES UNDER ORE

SHALE LIES ALONG ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
COLLOPHANE	PHOSPHATES
KAOLINITE	SILICATES

MINE/MILL INFORMATION

## UNDERGROUND MINING:

METHOD: ROOM AND PILLAR

CAPACITY: 322

UNITS: MT ORE/DAY

## ROCK AND WATER CONDITIONS:

HARDROCK WITH LITTLE WATER

SHAFTS - NUMBER: 4

AVERAGE DEPTH: 140 METERS

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE

LOCATION: EGYPT

LATITUDE: N 26 33 00

LONGITUDE: E 33 55 00

METHOD OF TRANSPORTATION: CONVEYOR

PERCENT SHIPPED: 100

DESTINATION FACILITY: MILL (ON-SITE)

LOCATION: EGYPT

LATITUDE: N 26 33 00

LONGITUDE: E 33 55 00

## BENEFICIATION:

METHOD: SIZING

## ----- DESCRIPTION OF MILLING -----

DESIGN CAPACITY: 300

ORE/DRY/SCREEN/CRUSH/SHIP

UNITS: MT ORE/DAY

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	99	30.13	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: EGYPT

LATITUDE: N 26 33 00 LONGITUDE: E 33 55 00

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: RAIL

DISTANCE (KM): 27

DESTINATION FACILITY: PORT

LOCATION: EGYPT

BIBLIOGRAPHY RECORDS

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## LITHOLOGY:

NAME OF FORMATION: DUWI FORMATION                    GEOLOGIC AGE: UPPER CRETACEOUS

DEFORMATION DESCRIPTION: FAULTING

RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

ROCK TYPE:

SHALE	LIES OVER ORE; LIES UNDER ORE
LIMESTONE	LIES OVER ORE
PHOSPHORITE	IS ORE
SANDSTONE	LIES OVER ORE; LIES UNDER ORE
SILTSTONE	LIES UNDER ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
APATITE	PHOSPHATES
PYRITE	SULFIDES
CALCITE	CARBONATES
DOLOMITE	CARBONATES
KAOLINITE	SILICATES

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SAID, R., ED. THE GEOLOGICAL AND ECONOMIC EVALUATION OF ABU TARTUR PHOSPHORITE DEPOSIT, WESTERN DESERT, EGYPT. EGYPT, GEOL. SURV. ANN. (EGY) VOL. 7, 1977, P. 130.

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ZAGHLoul, Z. M., AND B. MABROUK. ON URANIUM IN DAKHLA AND MAHAMID PHOSPHATE DEPOSITS. JOURNAL OF GEOLOGY, U A R, VOL 8, NO 2, 1964, P 79-87.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SEEAIYA WEST

SEQUENCE NUMBER: 7290000010

NATION: EGYPT

SUBDIVISION: NOT SUBDIVIDED

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 25 DEG 10 MIN 00 SEC

LONGITUDE: E 32 DEG 40 MIN 00 SEC

UTM - ZONE: 36 HEMISPHERE: NORTHERN

NORTHING: 2783285 EASTING: 466408

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 50 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

EL MAHAMID

## OWNERSHIP

ABU ZAABAL FERTILIZER &amp; CHEMICAL CO

## STATUS

OWNER-OPERATOR

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

## -----EXPLORATION METHODS-----

ORE-MINERAL IN PLACE

DRILLING/TEST PIT

YEAR OF DISCOVERY: 1870

YEAR OF INITIAL PRODUCTION: 1908

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: MASSIVE

CONTROLLING FEATURES: FOLDING

## MINERALIZED ZONE:

AVERAGE DEPTH: 8 METERS

MINIMUM DEPTH: 0 METERS

AVERAGE THICKNESS: 2.5 METERS

STRIKE/DIP: N45W/01W

## LITHOLOGY:

GEOLOGIC AGE: UPPER CRETACEOUS

DEFORMATION DESCRIPTION: MINOR FOLDING; FAULTING

ROCK TYPE:

GRAVEL LIES OVER ORE

SAND LIES OVER ORE

CLAY LIES OVER ORE

LIMESTONE LIES OVER ORE; LIES UNDER ORE

PHOSPHORITE IS ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
APATITE	PHOSPHATES
CALCITE	CARBONATES
KAOLINITE	SILICATES

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: STRIPPING	UNITS: MT ORE/DAY
CAPACITY: 2100	
DESCRIPTION OF COVER:	
SAND, GRAVEL	
AVERAGE COVER THICKNESS: 8 METERS	

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE	LOCATION: EGYPT
LATITUDE: N 25 10 00	LONGITUDE: E 32 40 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: TRUCK	DISTANCE (KM): 5
DESTINATION FACILITY: MILL (ON-SITE)	LOCATION: EGYPT
LATITUDE: N 25 10 00	LONGITUDE: E 32 40 00

## BENEFICIATION:

METHOD: FLOTATION	----- DESCRIPTION OF MILLING -----		
DESIGN CAPACITY: 2100	ORE/CRUSH/SIZE/GRIND/FLOAT/SHIP		
UNITS: MT ORE/DAY			

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	70	28	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE)	LOCATION: EGYPT
LATITUDE: N 25 10 00	LONGITUDE: E 32 40 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: RIVER	DISTANCE (KM): 500
DESTINATION FACILITY: REFINERY	LOCATION: EGYPT

BIBLIOGRAPHY RECORDS

BRITISH SULPHUR CORP., LTD. WORLD SURVEY, 4TH ED. 1980.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: QENA

SEQUENCE NUMBER: 7290000012

NATION: EGYPT

SUBDIVISION: NOT SUBDIVIDED

TYPE OF OPERATION: SURFACE

CURRENT STATUS: EXPLORER DEPOSIT

LATITUDE: N 26 DEG 10 MIN 00 SEC

LONGITUDE: E 32 DEG 52 MIN 00 SEC

UTM - ZONE: 36 HEMISPHERE: NORTHERN

NORTHING: 2893984 EASTING: 486674

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 250 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

NILE VALLEY

## OWNERSHIP

ARAB REPUBLIC OF EGYPT

## STATUS

OWNER

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1
UNDIFFERENTIATED	1,500,000,000
UNITS	MT ORE
YEAR/DATA	1978

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	25.5	WT-PCT

## RESERVE-RESOURCE - REMARKS

## SOURCE FOR RECORD 1:

MINING MAGAZINE. EGYPTIAN EXPLORATION. JAN. 1978.

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1975

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSITS

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDING; LITHOLOGY

## LITHOLOGY:

NAME OF FORMATION: MIDDLE PHOSPHATE GROUP

GEOLOGIC AGE: TERTIARY

ROCK TYPE:

PHOSPHORITE IS ORE

LIMESTONE LIES ABOVE ORE; LIES BELOW ORE

SHALE LIES ABOVE ORE; LIES BELOW ORE

## LITHOLOGY:

NAME OF FORMATION: UPPER PHOSPHATE GROUP GEOLOGIC AGE: TERTIARY

## ROCK TYPE:

PHOSPHORITE	IS ORE
LIMESTONE	LIES ABOVE ORE; LIES BELOW ORE
SHALE	LIES ABOVE ORE; LIES BELOW ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
FLUORAPATITE	PHOSPHATES	PHANERITIC-FINE
PYRITE	SULFIDES	PHANERITIC-FINE
QUARTZ	FORMS OF $SiO_2$	
CALCITE	CARBONATES	

BIBLIOGRAPHY RECORDS

BRITISH SULPHUR. WORLD SURVEY #4. 1980.

EL-KAMMAR, A.M., A. ZAYED AND S. A. AMER. RARE EARTHS OF THE NILE VALLEY PHOSPHORITES, UPPER EGYPT. CHEMICAL GEOLOGY, V. 24 1979, PP. 69-81.

MINING MAGAZINE. EGYPTIAN EXPLORATION. JAN. 1978.

FINLAND

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SIILINJARVI

SEQUENCE NUMBER: 4050250003

NATION: FINLAND

SUBDIVISION: KUOPIO

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 63 DEG 05 MIN 12 SEC

LONGITUDE: E 27 DEG 42 MIN 46 SEC

UTM - ZONE: 35 HEMISPHERE: NORTHERN

NORTHING: 6995246 EASTING: 535997

POINT OF REFERENCE: CFE BODY

PRECISION: 1 KILOMETER

ELEVATION: 100 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
CONCESSIONS

OWNERSHIP

STATUS

KEMIRA OY (GOVT.)

OWNER-OPERATOR

COMMODITY

MODIFIER

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

CALCIUM

CALCITE

BYPRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

INDICATED	RECORD 1	RECORD 2
UNITS	500,000,000	465,000,000
YEAR/DATA	MT ORE	MT ORE
	1981	1980

IN SITU GRADE:

RECORD ASSAY FORM  
 1 F205  
 CACO<sub>3</sub>

RESERVE-RESOURCE - REMARKS

SOURCE FOR RECORD 1:

CHADWICK, J. R. HOW SIILINJARVI SUCCESSFULLY FLOATS LOW-GRADE APATITE. WORLD MINING, JUNE, 1981, PP. 106-109.

SOURCE FOR RECORD 2:

BRITISH SULPHUR CORP., LTD. WORLD SURVEY OF PHOSPHATE DEPOSITS. 4TH EDITION, 1980, PP. 224-225.

DEPOSIT HISTORICAL INFORMATIONEXPLORATION METHODS

YEAR OF DISCOVERY: 1954

DRILLING/GRAVITATIONAL SURVEY/  
SURFACE GEOLOGICAL MAPPING

YEAR OF INITIAL PRODUCTION: 1980

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

MODE OF ORIGIN: HYDROTHERMAL

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: IGNEOUS

## MINERALIZED ZONE:

AVERAGE DEPTH: 5 METERS  
 AVERAGE LENGTH: 3500 METERS  
 AVERAGE THICKNESS: 150 METERS

MINIMUM DEPTH: 0 METERS  
 AVERAGE WIDTH: 600 METERS

## UNCONSOLIDATED MATERIAL:

AVERAGE THICKNESS: 5 METERS

## LITHOLOGY:

NAME OF FORMATION: SIILINJARVI COMPLEX  
 GEOLOGIC AGE: PRECAMBRIAN  
 ROCK TYPE:  
 CARBONATITE IS ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
CALCITE	CARBONATES
DOLOMITE	CARBONATES
PHLOGOPITE	SILICATES
FLUORAPATITE	PHOSPHATES

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: BENCH (BERM)  
 CAPACITY: 7600  
 PERCENT WASTE ROCK: 10.0  
 BENCH HEIGHT: 12 METERS

UNITS: MT ORE/DAY  
 AVERAGE COVER THICKNESS: 5 METERS

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE  
 LATITUDE: N 63 05 12  
 METHOD OF TRANSPORTATION: TRUCK  
 DESTINATION FACILITY: MILL (ON-SITE)  
 LATITUDE: N 63 05 12

LOCATION: FINLAND  
 LONGITUDE: E 27 42 46  
 PERCENT SHIPPED: 100  
 LOCATION: FINLAND  
 LONGITUDE: E 27 42 46

## BENEFICIATION:

METHOD: FLOTATION  
 DESIGN CAPACITY: 7600  
 UNITS: MT ORE/DAY

-----DESCRIPTION OF MILLING-----  
 ORE/CRUSH/STOCK/GRIND/CLASSIFY/  
 FLOTATION/THICKEN/FILTER

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	87	35.9	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE)	LOCATION: FINLAND
LATITUDE: N 63 05 12	LONGITUDE: E 27 42 46
PERCENT SHIPPED: 100	DISTANCE (KM): 70
METHOD OF TRANSPORTATION: TRUCK	
DESTINATION FACILITY: PORT	

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PUUSTINEN, KAUKO. GEOLOGY OF THE SIILINJARVI CARBONATITE COMPLEX IN EASTERN FINLAND. BULL. DE LA COMMISSION GEOLOGIQUE DE FINLANDE, NO. 249, OTANIEMI, 1971, P. 43.

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SOKLI

SEQUENCE NUMBER: 4050350002

NATION: FINLAND

SUBDIVISION: LAPPI

TYPE OF OPERATION: SURFACE

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 67 DEG 45 MIN 00 SEC

LONGITUDE: E 29 DEG 15 MIN 00 SEC

UTM - ZONE: 35 HEMISPHERE: NORTHERN

NORTHING: 7516535 EASTING: 595061

POINT OF REFERENCE: ORE BODY

PRECISION: 5 KILOMETERS

ELEVATION: 220 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDINGS

CONCESSIONS

OWNERSHIP

STATUS

RAUTARUUKKI OY (GOVERNMENT)

OWNER-OPERATOR

COMMODITY

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

RECORD 1

MEASURED 50,000,000

INDICATED 75,000,000

UNITS MT ORE

YEAR/DATA 1979

IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	19	WT-PCT

## RESERVE-RESOURCE - REMARKS

SOURCE FOR RECORD 1:

NOTHOLT, A. G. THE ECONOMIC GEOLOGY & DEVELOPMENT OF INGEOUS  
 PHOSPHATE DEPOSITS IN EUROPE AND THE USSR. ECON. GEOL., VOL. 74(2),  
 1979, PP. 339-350.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

AIRBORNE GEOPHYSICAL SURVEY

AIRBORNE GEOPHYSICAL SURVEY/SURFACE GEOLOGICAL  
 MAPPING/TEST PIT/DRILLING/GRAVITATIONAL SURVEY

YEAR OF DISCOVERY: 1967

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

MODE OF ORIGIN: HYDROTHERMAL

SHAPE OF ORE BODY: MASSIVE

MINERALIZED ZONE:

AVERAGE DEPTH: 5 METERS

MINIMUM DEPTH: 1 METER

AVERAGE THICKNESS: 25 METERS

UNCONSOLIDATED MATERIAL:

AVERAGE THICKNESS: 5 METERS

MINIMUM THICKNESS: 1 METER

## LITHOLOGY:

NAME OF FORMATION: SOKLI COMPLEX

GEOLOGIC AGE: PALEOZOIC

## ROCK TYPE:

CARBONATITE IS ORE

## MINERALIZATION:

## MINERAL NAME

## MINERAL CLASS

MICA

SILICATES

MAGNETITE

OXIDES (EXCLUDING SiO<sub>2</sub>)

CALCITE

CARBONATES

PYROCHLORITE

OXIDES (EXCLUDING SiO<sub>2</sub>)

FLUORAPATITE

PHOSPHATES

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RUSSELL, B. G., THE POSSIBLE RECOVERY DURING THE MANUFACTURE OF PHOSPHORIC ACID OF RARE EARTHS FROM FOSKOR CONCENTRATE. SOUTH AFRICAN MINERALS BUREAU, BULLETIN NO. 1, (N.D.).

WHITE, L. FINNS CONTINUE CONTRIBUTIONS TO ADVANCING WORLD MINING AND PROCESSING TECHNOLOGY. E. & M.J., FEBRUARY 1977, PP. 65-68.

## INDIA

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME:	JHAMARKOTRA	SEQUENCE NUMBER:	5330410047
NATION:	INDIA	SUBDIVISION:	RAJASTHAN
TYPE OF OPERATION:	SURFACE	CURRENT STATUS:	PRODUCER
LATITUDE:	N 24 DEG 28 MIN 00 SEC	LONGITUDE:	E 73 DEG 50 MIN 00 SEC
UTM - ZONE:	43	NORTHING:	2706238
HEMISPHERE:	NORTHERN	EASTING:	381761
POINT OF REFERENCE:	ORE BODY	PRECISION:	1 KILOMETER
ELEVATION:	520 METERS	PRECISION:	10 METERS
DATUM:	SEA LEVEL	YEAR OF INFORMATION:	1981
OWNERSHIP			
RAJASTHAN STATE MINES AND MINERALS, LTD. (INDIA GOVT).	STATUS OWNER-OPERATOR		
COMMODITY	MARKETABILITY		
PHOSPHATE	PRIMARY PRODUCT		

PUBLISHED RESERVE-RESOURCE INFORMATION

MEASURED	RECORD 1
UNITS	64,000,000
YEAR/DATA	MT ORE
	1981

## RESERVE-RESOURCE - REMARKS

RECORD 1: GRADE RANGES FROM 18 TO 30 PERCENT P205.

## SOURCES FOR RECORD 1:

RAHASTHAN STATE MINES AND MINERALS. L.T.D. A BRIEF INTRODUCTION.  
UDAIPUR, 1981.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:	-----EXPLORATION METHODS-----
ORE-MINERAL IN PLACE	TEST PIT/TRENCHING/DRILLING
YEAR OF DISCOVERY:	1968
YEAR OF INITIAL PRODUCTION:	1970

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
 MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
 SHAPE OF ORE BODY: LENTICULAR; IRREGULAR  
 CONTROLLING FEATURES: BEDDING

## MINERALIZED ZONE:

AVERAGE DEPTH: 24 METERS  
 AVERAGE LENGTH: 16000 METERS  
 STRIKE/DIP: S65E/45N

MINIMUM DEPTH: 0 METERS  
 AVERAGE THICKNESS: 6 METERS

## LITHOLOGY:

GEOLOGIC AGE: PRECAMBRIAN  
 ROCK TYPE:  
 PHOSPHORITE IS ORE  
 DOLOMITE GANGUE

## MINERALIZATION:

MINERAL NAME MINERAL CLASS  
 APATITE PHOSPHATES

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: STRIP-HILLSIDE

UNITS: MT ORE/DAY

CAPACITY: 1900

DESCRIPTION OF COVER:

MEDIUM-HARD ROCKS

AVERAGE COVER THICKNESS: 24 METERS

PERCENT WASTE ROCK: 80.0

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE

LOCATION: RAJASTHAN, INDIA

LATITUDE: N 24 28 00

LONGITUDE: E 73 50 00

PERCENT SHIPPED: 100

DISTANCE (KM): 2

METHOD OF TRANSPORTATION: TRUCK

LOCATION: RAJASTHAN, INDIA

DESTINATION FACILITY: MILL (ON-SITE)

LONGITUDE: E 73 50 00

LATITUDE: N 24 28 00

## BENEFICIATION:

METHOD: SIZING

----- DESCRIPTION OF MILLING -----

DESIGN CAPACITY: 1900

ORE/CRUSH/LOADOUT

UNITS: MT ORE/DAY

## PRODUCT

PHOSPHATE ROCK

## ASSAY FORM

P205

## RECOVERY

95

## CONCENTRATE GRADE

30.0

## UNIT

WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE)

LOCATION: RAJASTHAN, INDIA

LATITUDE: N 24 28 00

LONGITUDE: E 73 35 00

PERCENT SHIPPED: 100

DESTINATION FACILITY: FOB MILL

BIBLIOGRAPHY RECORDS

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RAHASTHAN STATE MINES AND MINERALS LTD. A GLIMPSE ON JHAMARKOTRA ROCK PHOSPHATE MINING PROJECT. UDAIPUR C.1979.

RAHASTHAN STATE MINES AND MINERALS, LTD. A BRIEF INTRODUCTION. UDAIPUR, 1981.

IRAG

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: AKASHAT

SEQUENCE NUMBER: 5050000002

NATION: IRAG

SUBDIVISION: NOT SUBDIVIDED

TYPE OF OPERATION: SURFACE

CURRENT STATUS: DEVELOPING DEPOSIT

LATITUDE: N 34 DEG 00 MIN 00 SEC

LONGITUDE: E 40 DEG 25 MIN 00 SEC

UTM - ZONE: 37 HEMISPHERE: NORTHERN

NORTHING: 3762866 EASTING: 630191

POINT OF REFERENCE: CRE BODY

PRECISION: 1 KILOMETER

ELEVATION: 350 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
GOVERNMENT CONTROLLEDOWNERSHIP  
STATE ORGANIZATION FOR MINERALSSTATUS  
OWNER-OPERATORCOMMODITY  
PHOSPHATEMARKETABILITY  
PRIMARY PRODUCTPUBLISHED RESERVE-RESOURCE INFORMATION

MEASURED	RECORD 1
UNITS	450,000,000
YEAR/DATA	MT ORE 1981

IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	21.04	WT-PCT

## RESERVE-RESOURCE - REMARKS

SOURCE FOR RECORD 1:

ARAB FEDERATION OF CHEMICAL FERTILIZER PRODUCERS. QUARTERLY JOURNAL. ISSUE #1, THIRD YEAR, MARCH 1981.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

GEOPHYSICAL ANOMALY

RADIOACTIVITY SURVEY/

YEAR OF DISCOVERY: 1955

SUBSURFACE GEOLOGICAL MAPPING/CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: LITHOLOGY

## MINERALIZED ZONE:

MINIMUM DEPTH: 0 METERS

STRIKE/DIP: N90E/01N

AVERAGE THICKNESS: 10.5 METERS

## LITHOLOGY:

NAME OF FORMATION: TAYARAT FORMATION

GEOLOGIC AGE: UPPER CRETACEOUS

DEFORMATION DESCRIPTION: NO DEFORMATION

## ROCK TYPE:

PHOSPHORITE IS ORE

LIMESTONE LIES OVER ORE; LIES UNDER ORE

## LITHOLOGY:

NAME OF FORMATION: UM-ER-RADKUMA FORMATION

GEOLOGIC AGE: PALEOCENE

DEFORMATION DESCRIPTION: NO DEFORMATION

## ROCK TYPE:

PHOSPHORITE IS ORE

LIMESTONE LIES OVER ORE; LIES UNDER ORE

## MINERALIZATION:

MINERAL NAME MINERAL CLASS

CALCITE CARBONATES

DOLOMITE CARBONATES

QUARTZ FORMS OF SiO<sub>2</sub>

FRANCOLITE PHOSPHATE

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: STRIPPING

CAPACITY: 10300 UNITS: MT ORE/DAY

## DESCRIPTION OF COVER:

HARD ROCKS

AVERAGE COVER THICKNESS: 10.5 METERS PERCENT WASTE ROCK: 50.0

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE

LOCATION: IRAQ

LATITUDE: N 34 00 00

LONGITUDE: E 40 25 00

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: TRUCK; RAIL

DESTINATION FACILITY: MILL (OFF-SITE)

LOCATION: IRAQ

LATITUDE: N 34 25 00

LONGITUDE: E 41 12 00

## BENEFICIATION:

METHOD: TEMPERATURE DECOMPOSITION

----DESCRIPTION OF MILLING----

DESIGN CAPACITY: 10300

ORE/CRUSH/CALCINE/COOLED/SLURRY

UNITS: MT ORE/DAY

CYCLONE

PRODUCT  
CONCENTRATEASSAY FORM  
P205RECOVERY  
75CONCENTRATE GRADE  
31.75UNIT  
WT-PCT

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PHOSPHATE DEPOSIT. J. GEOL. SOC., IRAQ, VIX, PP. 1-33, 1976.

BRITISH SULPHUR. WORLD SURVEY OF PHOSPHATE DEPOSITS. FOURTH EDITION,  
1980.

MINING JOURNAL. METHODS AND MACHINES. JUNE 3, 1977

ISRAELLOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: ARAD

SEQUENCE NUMBER: 5080000001

NATION: ISRAEL

SUBDIVISION: NOT SUBDIVIDED

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 31 DEG 07 MIN 00 SEC

LONGITUDE: E 35 DEG 12 MIN 00 SEC

UTM - ZONE: 36 HEMISPHERE: NORTHERN

NORTHING: 3444429 EASTING: 709797

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 150 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
MINERALS ONLYALTERNATE NAMES  
ZEFA E\*FE MINERAL DEPOSITSOWNERSHIP  
NEGEV PHOSPHATES LTDSTATUS  
OWNER-OPERATORCOMMODITY  
PHOSPHATEMARKETABILITY  
PRIMARY PRODUCTPUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

ORE-MINERAL IN PLACE

BEDROCK SAMPLING/CORE DRILLING

YEAR OF DISCOVERY: 1930

YEAR OF INITIAL PRODUCTION: 1970

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

MINERALIZED ZONE:

AVERAGE DEPTH: 18 METERS

MINIMUM DEPTH: 5 METERS

AVERAGE THICKNESS: 10.2 METERS

UNCONSOLIDATED MATERIAL:

AVERAGE THICKNESS: 18 METERS

MINIMUM THICKNESS: 5 METERS

**LITHOLOGY:**

NAME OF FORMATION: MISHASH  
 DEFORMATION DESCRIPTION: MINOR FOLDING  
 RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION  
 GEOLOGIC AGE: TERTIARY  
 ROCK TYPE:  
 PHOSPHORITE IS ORE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS
CALCITE	CARBONATES
QUARTZ	FORMS OF SiO <sub>2</sub>
OPAL	FORMS OF SiO <sub>2</sub>
DOLOMITE	CARBONATES
GYPSUM	SULFATES & CHROMATES
FRANCOLITE	PHOSPHATES

**MINE/MILL INFORMATION****SURFACE MINING:**

METHOD: STRIPPING  
 CAPACITY: 2200 UNITS: MT ORE/DAY  
 DESCRIPTION OF COVER:  
 SAND, SILT  
 AVERAGE COVER THICKNESS: 18 METERS PERCENT WASTE ROCK: 77.8

**TRANSPORTATION (ORE):**

ORIGINATING FACILITY: MINE	LOCATION: ISRAEL
LATITUDE: N 31 07 00	LONGITUDE: E 35 12 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: TRUCK	DISTANCE (KM): 6.0
DESTINATION FACILITY: MILL (OFF-SITE)	LOCATION: ISRAEL
LATITUDE: N 31 05 00	LONGITUDE: E 35 11 00

**BENEFICIATION:**

METHOD: WASHING  
 DESIGN CAPACITY: 2100 UNITS: MT ORE/DAY -----DESCRIPTION OF MILLING-----  
 CRUSH/SCREEN/CYCLONE/DRY

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
CONCENTRATE	F205	64	33.2	WT-PCT

TRANSPORTATION FOR PRODUCT: PHOSPHATE CONCENTRATE  
 ORIGINATING FACILITY: MILL (OFF-SITE) LOCATION: ISRAEL  
 LATITUDE: N 31 05 00 LONGITUDE: E 35 11 00  
 PERCENT SHIPPED: 100  
 METHOD OF TRANSPORTATION: RAIL DISTANCE (KM): 152  
 DESTINATION FACILITY: PORT LOCATION: ISRAEL

BIBLIOGRAPHY RECORDS

BRITISH SULPHUR. WORLD SURVEY OF PHOSPHATES. 4TH EDITION, PART 4,  
MIDDLE EAST, ASIA AND OCEANIA, 1980, P. 161-164

INTERNATIONAL URANIUM RESOURCES EVALUATION PROGRAM (IUREP). NO. 139,  
ISRAEL, AIEA, VIENNA, 1980.

PHOSPHORUS & POTASSIUM. ISRAEL. NO. 94, MARCH/APRIL, 1978.

PHOSPHORUS & POTASSIUM. NEGEV PHOSPHATES COME OF AGE. NO. 107,  
MAY/JUNE, 1980, PP. 27-32.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: ORON

SEQUENCE NUMBER: 5080000005

NATION: ISRAEL

SUBDIVISION: NOT SUBDIVIDED

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 31 DEG 52 MIN 00 SEC

LONGITUDE: E 34 DEG 59 MIN 00 SEC

UTM ZONE: 36 HEMISPHERE: NORTHERN

NORTHING: 3416326 EASTING: 689626

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 250 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
MINERALS ONLY

OWNERSHIP

STATUS

NEGEV PHOSPHATES LTD.

OWNER-OPERATOR

COMMODITY  
PHOSPHATE  
URANIUMMARKETABILITY  
PRIMARY PRODUCT  
RECOVERABLEPUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----  
BEDROCK SAMPLING/CORE DRILLING/DRILLING

PRE-MINERAL IN PLACE

YEAR OF DISCOVERY: 1950

YEAR OF INITIAL PRODUCTION: 1952

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: LITHOLOGY

MINERALIZED ZONE:

AVERAGE DEPTH: 12.4 METERS

MINIMUM DEPTH: 7 METERS

AVERAGE THICKNESS: 5.7 METERS

UNCONSOLIDATED MATERIAL:

AVERAGE THICKNESS: 12.4 METERS

MINIMUM THICKNESS: 7 METERS

LITHOLOGY:

NAME OF FORMATION: MISHASH FORMATION GEOLOGIC AGE: UPPER CRETACEOUS

DEFORMATION DESCRIPTION: MINOR FOLDING

RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

GEOLOGIC AGE: TERTIARY

ROCK TYPE:

PHOSPHORITE IS ORE

SHALE LIES OVER ORE; LIES UNDER ORE

LIMESTONE LIES OVER ORE; LIES UNDER ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
CHERT	SILICATES
CALCITE	CARBONATES
FRANCOLITE	PHOSPHATES

## SURFACE MINING:

METHOD: STRIPPING	
CAPACITY: 4000	UNITS: MT ORE/DAY
DESCRIPTION OF COVER:	HARDNESS OF ORE:
SAND, SILT	SAND, SILT
AVERAGE COVER THICKNESS: 12.4 METERS	PERCENT WASTE ROCK: 72.0

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE	LOCATION: ISRAEL
LATITUDE: N 30 52 00	LONGITUDE: E 34 59 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: TRUCK	DISTANCE (KM): 5.0
DESTINATION FACILITY: MILL	LOCATION: ISRAEL
LATITUDE: N 30 55 00	LONGITUDE: E 35 01 00

## BENEFICIATION:

METHOD: WASHING	----- DESCRIPTION OF MILLING -----
DESIGN CAPACITY: 4000	ORE/CRUSH/SCREEN/WASH/DESLIME/WASH/FILTER/
UNITS: MT ORE/DAY	DRY/LOADOUT

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE CONCENTRATE	P205	58	34.3	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE CONCENTRATE

ORIGINATING FACILITY: MILL	LOCATION: ISRAEL
LATITUDE: N 30 55 00	LONGITUDE: E 35 01 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: RAIL	DISTANCE (KM): 175
DESTINATION FACILITY: PORT	LOCATION: ISRAEL

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BRITISH SULPHUR CORP., LTD. SURVEY OF WORLD PHOSPHATES. 4TH EDITION, 1980, PP. 162-163.

ENGINEERING AND MINING JOURNAL. NEVEG PHOSPHATES. MARCH 1981

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PHOSPHORUS & POTASSIUM. NEGEV PHOSPHATES COME OF AGE. NO. 107., MAY/JUNE 1980.

PHOSPHORUS & POTASSIUM. ROCK LOADER FOR ASHDOD. NO. 104, NOV/DEC 1979.

WORLD MINING. ISRAEL. CAT. & DIR. NO., 1980.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: NAHAL ZIN

SEQUENCE NUMBER: 5080000006

NATION: ISRAEL

SUBDIVISION: NOT SUBDIVIDED

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 30 DEG 51 MIN 00 SEC

LONGITUDE: E 35 DEG 06 MIN 00 SEC

UTM - ZONE: 36 HEMISPHERE: NORTHERN

NORTHING: 3414682 EASTING: 700817

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 150 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING

MINERALS ONLY

OWNERSHIP

NEGEV PHOSPHATES LTD.

STATUS

OWNER-OPERATOR

COMMODITY

PHOSPHATE

MARKETABILITY

PRIMARY

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

ORE-MINERAL IN PLACE

-----EXPLORATION METHODS-----

YEAR OF DISCOVERY: 1930

BEDROCK SAMPLING/CORE DRILLING/  
DRILLING

YEAR OF INITIAL PRODUCTION: 1978

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: LITHOLOGY

MINERALIZED ZONE:

AVERAGE DEPTH: 1.5 METERS

MINIMUM DEPTH: 0 METERS

AVERAGE THICKNESS: 8.52 METERS

UNCONSOLIDATED MATERIAL:

AVERAGE THICKNESS: 1.5 METERS

LITHOLOGY:

NAME OF FORMATION: MISHASH FORMATION GEOLOGIC AGE: UPPER CRETACEOUS

DEFORMATION DESCRIPTION: MINOR FOLDING

RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

GEOLOGIC AGE: TERTIARY

ROCK TYPE:

PHOSPHORITE IS ORE

SHALE LIES OVER ORE; LIES UNDER ORE

LIMESTONE LIES OVER ORE; LIES UNDER ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
CHERT	SILICATES
CALCITE	CARBONATES
FRANCOLITE	PHOSPHATES

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: STRIPPING	UNITS: MT ORE/DAY
CAPACITY: 15900	HARDNESS OF ORE:
DESCRIPTION OF COVER:	SAND, SILT
SAND, SILT	PERCENT WASTE ROCK: 78.5
AVERAGE COVER THICKNESS: 1.5 METERS	

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE	LOCATION: ISRAEL
LATITUDE: N 30 51 00	LONGITUDE: E 35 06 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: TRUCK	DISTANCE (KM): 3.0
DESTINATION FACILITY: MILL (ON-SITE)	LOCATION: ISRAEL
LATITUDE: N 30 51 00	LONGITUDE: E 35 06 00

## BENEFICIATION:

METHOD: WASHING	-----DESCRIPTION OF MILLING-----
DESIGN CAPACITY: 15200	ORE/CRUSH/SCREEN/WASH/DESLIME/
UNITS: MT ORE/DAY	WASH/FILTER/DRY/LOADOUT

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
CONCENTRATE	P205	48	32.0	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE CONC

ORIGINATING FACILITY: MILL (ON-SITE)	LOCATION: ISRAEL
LATITUDE: N 30 51 00	LONGITUDE: E 35 06 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: RAIL	DISTANCE (KM): 205
DESTINATION FACILITY: PORT	LOCATION: ISRAEL

BIBLIOGRAPHY RECORDS

DEVOTC, R. H., AND D. N. STEVENS. URANIFEROUS PHOSPHATE DEPOSITS OF THE FREE WORLD. U.S. DEPT. ENERGY CONTRACT, GRAND JUNCTION, GJBX 110 (79), 1979, P. 386-390.

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INTERNATIONAL URANIUM RESOURCES EVALUATION PROGRAM (IUREP). NO. 139, ISRAEL, AIEA, VIENNA, 1980.

KETZINEL, Z. URANIUM SOURCES, PRODUCTION AND DEMAND IN ISRAEL. IN, URANIUM AND THORIUM RESOURCES, VOL. 8, U.N. INT'L CONF. PEACEFUL USES OF ATOMIC ENERGY, GENEVA, 1972, PP. 113-119.

MINERALS YEARBOOK. ISRAEL. WORLD REVIEW 1978-79.

NATHAN, Y. AND Y. SHILONI. EXPLORATION FOR URANIUM IN PHOSPHORITES: A NEW STUDY ON URANIUM IN ISRAEL PHOSPHORITES. IN: EXPLORATION FOR URANIUM ORE DEPOSITS: IAEA, VIENNA, PP. 645-655, 1976.

PHOSPHORUS & POTASSIUM. NEGEV PHOSPHATES COME OF AGE. NO. 107,  
MAY/JUNE, 1980, F. 27-32

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: EIN YAHAV

SEQUENCE NUMBER: 5080000007

NATION: ISRAEL

SUBDIVISION: NOT SUBDIVIDED

TYPE OF OPERATION: SURFACE

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 30 DEG 37 MIN 00 SEC

LONGITUDE: E 35 DEG 11 MIN 00 SEC

UTM - ZONE: 36 HEMISPHERE: NORTHERN

NORTHING: 3388969 EASTING: 709292

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 68 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
EXPLORATION PERMITS

ALTERNATE NAMES

EIN YUHAN

OWNERSHIP  
ULTRAMAR MINERALS CORPORATIONSTATUS  
OWNER-OPERATORCOMMODITY  
PHOSPHATE  
URANIUMMARKETABILITY  
PRIMARY PRODUCT  
PHOSPHATEPUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

ORE-MINERAL IN PLACE

YEAR OF DISCOVERY: 1957

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: LITHOLOGY; FOLDING

MINERALIZED ZONE:

AVERAGE DEPTH: 20 METERS

AVERAGE THICKNESS: 11 METERS

STRIKE: N45E

UNCONSOLIDATED MATERIAL:

AVERAGE THICKNESS: 20 METERS

### LITHOLOGY:

BOOK REVIEWS

PHOSPHORITE IS ORE  
UNSPECIFIED SEDIMENTARY LIES OVER ORE  
LIME STONE LIES OVER ORE; LIES UNDER ORE

## **FINERALIZATION:**

MINERAL NAME	MINERAL CLASS
FRANCOLITE	PHOSPHATE

## BIBLIOGRAPHY RECORDS

BRITISH SULPHUR CORP., LTD. WORLD SURVEY OF PHOSPHATE DEPOSITS. THIRD EDITION, 1971.

INTERNATIONAL URANIUM EVALUATION PROGRAM (IUREP). ISRAEL. NO. 139,  
VIENNA, 1980.

JORDANLOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: EL HASA/ EL ABIAD

SEQUENCE NUMBER: 5110000005

NATION: JORDAN

SUBDIVISION: NOT SUBDIVIDED

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 30 DEG 49 MIN 00 SEC

LONGITUDE: E 36 DEG 00 MIN 00 SEC

UTM - ZONE: 37 HEMISPHERE: NORTHERN

NORTHING: 3412952 EASTING: 212986

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 800 METERS

PRECISION: 500 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING

PRIVATE LEASE; CONCESSIONS

## ALTERNATE NAMES

EL ABIAD

EL ABIUTH

WADI EL ABIYAO

WADI EL ABIUTH

EL HASA

EL HASSA

GATRANA

## OWNERSHIP

JORDAN PHOSPHATE MINES CO, S.A.

## STATUS

OWNER-OPERATOR

## COMMODITY

PHOSPHATE

## MARKETABILITY

URANIUM

PRIMARY PRODUCT

RECOVERABLE

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2
MEASURED	178,060,000	-----
INDICATED	22,540,000	-----
INFERRRED	-----	342,000,000
UNITS	MT ORE	MT ORE
YEAR/DATA	1981	1980

## RESERVE-RESOURCE REMARKS

## SOURCE FOR RECORD 1:

MINING MAGAZINE. JORDON MINES PHOSPHATE. MAY 1981, PP. 376-389.

## SOURCE FOR RECORD 2:

ARAB FEDERATION CHEMICAL FERTILIZATION PRODUCERS. QUARTERLY JOURNAL, ISSUE 4, SECOND YEAR, DECEMBER 1980.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

-----EXPLORATION METHODS-----

ORE-MINERAL IN PLACE

CORE DRILLING

YEAR OF DISCOVERY: 1903



BIBLIOGRAPHY RECORDS

ARAB FEDERATION CHEMICAL FERTILIZATION PRODUCERS. QUARTERLY JOURNAL,  
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BRITISH SULPHUR CORP., LTD. WORLD SURVEY OF PHOSPHATE DEPOSITS. 4TH  
EDITION, 1980.

COPPENS, R., S. BASHIR, AND P. RICHARD. RADIOACTIVITY OF EL HASA  
PHOSPHATES, A PRELIMINARY STUDY. MINERALIUM DEPOSITA, VOL. 12, 1977, PP.  
189-196.

EARTH SCIENCES, INC. URANIFEROUS PHOSPHATE RESOURCES OF THE FREE WORLD.  
U.S. DEPT. ENERGY, CONTRACT GJBX 110-79, GRAND JUNCTION, 1979, PP. 60-62.

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BOOM. VOL 166, NO. 7, JULY 1965.

JONES, G. K. THE INDUSTRIAL MINERALS OF JORDAN. INDUSTRIAL MINERALS,  
JAN. 1980.

MINING MAGAZINE. JORDON MINES PHOSPHATE. MAY 1981, PP. 376-389.

PHOSPHOROUS & POTASSIUM. THE JORDANIAN PHOSPHATE MINING INDUSTRY, RECENT  
DEVELOPMENTS AT EL HASA AND FUTURE PLANS. NO. 34, MARCH/APRIL, 1968.

REEVES, J. J. AND T. A. K. SAADI. FACTORS CONTROLLING THE DEPOSITION OF  
SOME PHOSPHATE BEARING STRATA FROM JORDAN. ECON. GEOL., VOL. 66, 1971,  
PP. 451-465.

WORLD MINING. EL HASA AND ABIAD. OCT. 1979

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: RUSEIFA

SEQUENCE NUMBER: 5110000006

NATION: JORDAN

SUBDIVISION: NOT SUBDIVIDED

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 32 DEG 00 MIN 00 SEC

LONGITUDE: E 36 DEG 02 MIN 00 SEC

UTM - ZONE: 37 HEMISPHERE: NORTHERN

NORTHING: 3544095 EASTING: 219721

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 800 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING:

GOVERNMENT CONTROLLED

OWNERSHIP

STATUS

JORDON PHOSPHATE MINING CO.

OWNER-OPERATOR

COMMODITY

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

URANIUM

RECOVERABLE

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2
MEASURED	67,000,000	-----
INDICATED	11,500,000	-----
INFERRRED	-----	39,000,000
UNITS	MT ORE	MT ORE
YEAR/DATA	1981	1974

RESERVE-RESOURCE - REMARKS

SOURCE FOR RECORD 1:

MINING MAGAZINE. JORDON MINES PHOSPHATE. MAY 1981, PP  
376-389.

SOURCE FOR RECORD 2:

WORLD BANK. 1974.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

----- EXPLORATION METHODS -----

CORE-MINERAL IN PLACE

CORE DRILLING

YEAR OF DISCOVERY: 1903

YEAR OF INITIAL PRODUCTION: 1934

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: LITHOLOGY

DEGREE OF WALL ROCK ALTERATION: NONE

## MINERALIZED ZONE:

AVERAGE DEPTH: 16.5 METERS  
 AVERAGE THICKNESS: 6 METERS

MINIMUM DEPTH: 15 METERS

## UNCONSOLIDATED MATERIAL:

AVERAGE THICKNESS: 16.5 METERS

MINIMUM THICKNESS: 15 METERS

## LITHOLOGY:

NAME OF FORMATION: MIDDLE BELGA SERIES      GEOLOGIC AGE: UPPER CRETACEOUS  
 DEFORMATION DESCRIPTION: NO DEFORMATION

## ROCK TYPE:

PHOSPHORITE	IS ORE
LIMESTONE	LIES OVER ORE; LIES UNDER ORE
CHERT	LIES OVER ORE; LIES UNDER ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
COLLOPHANE	PHOSPHATES
CALCITE	CARBONATES
GYPSUM	SULFATES & CHROMATES
QUARTZ	FORMS OF SiO <sub>2</sub>
FRANCOLITE	PHOSPHATES

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: STRIPPING

CAPACITY: 3700

UNITS: MT ORE/DAY

## DESCRIPTION OF COVER:

SAND, SILT

AVERAGE COVER THICKNESS: 16.5 METERS      PERCENT WASTE ROCK: 73.0

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE

LOCATION: JORDAN

LATITUDE: N 32 00 00

LONGITUDE: E 36 02 00

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: TRUCK

DISTANCE (KM): 5.0

DESTINATION FACILITY: MILL (ON-SITE)

LOCATION: JORDAN

## BENEFICIATION:

METHOD: WASHING

-----DESCRIPTION OF MILLING -----

DESIGN CAPACITY: 3700

UNITS: MT ORE/DAY

ORE/CRUSH/SCREENED/DESLIMED/FILTERED/DRIED

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
CONCENTRATE	P205	75	30.7	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE CONCENTRATE

ORIGINATING FACILITY: MILL (ON-SITE)      LOCATION: JORDAN

PERCENT SHIPPED: 100

DESTINATION FACILITY: PORT

LOCATION: JORDAN

LOCATION: JORDAN

BIBLIOGRAPHY RECORDS

ABU HASSAN, A. PHOSPHATE ROCK IN JORDAN. ISMA EAST REGIONAL MEETING ON RAW MATERIALS, KUWAIT, FEBRUARY 17-19, 1981.

AFCFP QUARTERLY JOURNAL. ISSUE 4, SECOND YEAR, DECEMBER 1980

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JONES, G.K. THE INDUSTRIAL MINERALS OF JORDAN. INDUSTRIAL MINERALS, JANUARY 1980

MINING MAGAZINE. JORDAN MINES PHOSPHATE. MAY 1981, P. 376-38

REEVES, J. J., AND T. A. K. SAADI. FACTORS CONTROLLING THE DEPOSITION OF SOME PHOSPHATE BEARING STRATA FROM JORDAN. ECON. GEOL., VOL. 66, 1971, PP. 451-465.

RUGG, E.S. JORDAN PREPARES FOR MAJOR PHOSPHATE BOOM. E. & M.J., VOL. 166, NO. 7, JULY 1965

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: ESH-SHIDIYAH                    SEQUENCE NUMBER: 5110000007

NATION: JORDAN

TYPE OF OPERATION: SURFACE

LATITUDE: N 29 DEG 40 MIN 00 SEC

UTM - ZONE: 37 HEMISPHERE: NORTHERN

POINT OF REFERENCE: ORE BODY

ELEVATION: 900 METERS

DATUM: SEA LEVEL

SUBDIVISION: NOT SUBDIVIDED

CURRENT STATUS: EXPLORED DEPOSIT

LONGITUDE: E 36 DEG 00 MIN 00 SEC

NORTHING: 3285436 EASTING: 209620

PRECISION: 1 KILOMETER

PRECISION: 100 METERS

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING:

PRIVATE LEASE

OWNERSHIP

JORDON PHOSPHATE MINES CO. S.A.

STATUS

OWNER-OPERATOR

COMMODITY

PHOSPHATE

MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2
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MEASURED	790,000,000	300,000,000
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INDICATED	133,000,000	200,000,000
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UNITS	MT ORE	MT ORE
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YEAR/DATA	1981	1976
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IN SITU GRADE:	RECORD	ASSAY FORM	GRADE	UNIT
	2 (MEASURED)	P205	25.2	WT-PCT
	2 (INDICATED)	P205	24.8	WT-PCT

## RESERVE-RESOURCE - REMARKS

SOURCE FOR RECORD 1:

MINING MAGAZINE. JORDAN MINES PHOSPHATE. MAY 1981, PP. 376-389.

SOURCE FOR RECORD 2:

JONES, G. K. THE INDUSTRIAL MATERIALS OF JORDAN. INDUSTRIAL MINERALS, JANUARY 1980.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

ORE-MINERAL IN PLACE

YEAR OF DISCOVERY: 1978

-----EXPLORATION METHODS-----

CORE DRILLING/TEST PIT

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
 MODE OF ORIGIN: SEDIMENTATION  
 SHAPE OF ORE BODY: LENTICULAR  
 CONTROLLING FEATURES: LITHOLOGY  
 DEGREE OF WALL ROCK ALTERATION: NONE

MINERALIZED ZONE:

AVERAGE DEPTH: 40 METERS

AVERAGE THICKNESS: 8 METERS

LITHOLOGY:

NAME OF FORMATION: MIDDLE BELGA SERIES GEOLOGIC AGE: UPPER CRETACEOUS  
 DEFORMATION DESCRIPTION: NO DEFORMATION

ROCK TYPE:

LIMESTONE	LIES OVER ORE
PHOSPHORITE	IS ORE
SANDSTONE	LIES UNDER ORE

MINERALIZATION:

MINERAL NAME	MINERAL CLASS
QUARTZ	FORMS OF SiO <sub>2</sub>
CALCITE	CARBONATES
CHALCEDONY	FORMS OF SiO <sub>2</sub>
FRANCOLITE	PHOSPHATE

BIBLIOGRAPHY RECORDS

ABU HASSAN, A. PHOSPHATE ROCK IN JORDAN. ISMA, MIDDLE EAST REGIONAL MEETING ON RAW MATERIALS. KUWAIT, FEBRUARY 17-19, 1981.

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JONES, G.K., THE INDUSTRIAL MATERIALS OF JORDAN. INDUSTRIAL MINERALS, JANUARY 1980.

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MINING MAGAZINE. JORDAN PHOSPHATES. JANUARY 1979, P. 83.

REEVES, J. J., AND T. A. K. SAADI. FACTORS CONTROLLING THE DEPOSITION OF SOME PHOSPHATE BEARING STRATA FROM JORDAN. ECON. GEOL., VOL. 66, 1971, PP. 451-465.

RUGG, E. S. JORDAN PREPARES FOR MAJOR PHOSPHATE BOOM. E& M.J., VOL. 166, NO. 7, JULY 1965

MEXICOLOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SANTA DOMINGO

SEQUENCE NUMBER: 2010000018

NATION: MEXICO

TYPE OF OPERATION: SURFACE

CURRENT STATUS: DEVELOPING DEPOSIT

LATITUDE: N 24 DEG 17 MIN 24 SEC

LONGITUDE: W 111 DEG 00 MIN 00 SEC

UTM - ZONE: 12 HEMISPHERE: NORTHERN

NORTHING: 2686179 EASTING: 500000

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 19 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

## OWNERSHIP

## STATUS

ROCA FOSFORICA MEXICANA S. A.  
(ROFOMEX) - GOVT.

OWNER-OPERATOR

## COMMODITY

## MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

RECORD 1

MEASURED 1,100,000,000

UNITS MT ORE

YEAR/DATA 1981

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	4.5	WT-PCT

## RESERVE-RESOURCE - REMARKS

## SOURCE FOR RECORD 1:

HARRIS, R. ROFOMEX MOVES MEXICO TOWARD PHOSPHATE SELF-SUFFICIENCY. ENG. AND MIN. J., V. 182, JULY 1981, PP. 54-58.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

## -----EXPLORATION METHODS-----

CRE-MINERAL IN PLACE

WATER JET DRILLING

YEAR OF DISCOVERY: 1950

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: PLACER; SEDIMENTARY

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDING

## MINERALIZED ZONE:

AVERAGE DEPTH: 0 METERS

AVERAGE THICKNESS: 18 METERS

## UNCONSOLIDATED MATERIAL:

AVERAGE THICKNESS: 0 METERS

**LITHOLOGY:**

NAME OF FORMATION: SOLEDAD

GEOLOGIC AGE: RECENT

DEFORMATION DESCRIPTION: NO DEFORMATION

**ROCK TYPE:**

SAND	NEAR ORE; IS ORE
CLAY	NEAR ORE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
FRANCOLITE	PHOSPHATES	VARIABLE
QUARTZ	FORMS OF SiO <sub>2</sub>	VARIABLE
FELDSPAR	SILICATES	VARIABLE
MAGNETITE	OXIDES (EXCLUDE SiO <sub>2</sub> )	VARIABLE
ILMENITE	MULTIPLE OXIDES CONTAINING Nb, Ta, Ti	VARIABLE
ZIRCON	SILICATES	VARIABLE

**BIBLIOGRAPHY RECORDS**

ANGLEJAN-CHATILLON, B.F. THE MARINE PHOSPHORITE DEPOSIT OF BAJA CALIFORNIA, MEXICO: PRESENT ENVIRONMENT AND RECENT HISTORY. DISSERTATION, UNIVERSITY OF CALIFORNIA, SAN DIEGO, 1965, 195P.

BRITISH SULPHUR. WORLD SURVEY OF PHOSPHATE DEPOSITS. 4TH EDITION, 1980.

CLARKE, GERRY. MEXICAN PHOSPHATE - A STRIVE FOR SELF-SUFFICIENCY. INDUSTRIAL MINERALS, MAY, 1980, P. 79-91.

DEVITO, R. H. URANIFEROUS PHOSPHATE DEPOSITS. VOL. 1, GJBX-110(79), GRAND JUNCTION, 1979, P. 63-66.

EMERY, K. O. AND R. S. DIETZ. SUBMARINE PHOSPHORITE DEPOSITS OFF CALIFORNIA AND MEXICO. CALIF. DIV. MINES AND GEOL., VOL. 46, 1950, P. 7-15.

HARRIS, R. ROMEX MOVES MEXICO TOWARD PHOSPHATE SELF-SUFFICIENCY. E&MJ, V. 182, JULY 1981, PP. 54-58.

PHEGGER, F. B. AND G. C. EWING. SEDIMENTOLOGY AND OCEANOGRAPHY OF COASTAL LAGOONS IN BAJA CALIFORNIA, MEXICO. G.S.A., BULL. VOL. 73, 1962, P. 145-182.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SAN HILARIO

SEQUENCE NUMBER: 2010050003

NATION: MEXICO

SUBDIVISION: BAJA CALIFORNIA SUR  
CURRENT STATUS: EXPLORED DEPOSIT  
LONGITUDE: W 111 DEG 30 MIN 00 SEC  
NORTHING: 2700295 EASTING: 449308  
PRECISION: 1 KILOMETER  
PRECISION: 100 METERS  
YEAR OF INFORMATION: 1981

TYPE OF OPERATION: SURFACE

LATITUDE: N 24 DEG 25 MIN 00 SEC

UTM - ZONE: 12 HEMISPHERE: NORTHERN

POINT OF REFERENCE: ORE BODY

ELEVATION: 200 METERS

DATUM: SEA LEVEL

## OWNERSHIP

## STATUS

ROCO FOSFORICA MEXICANA S. A.  
(ROFOMEX) - GOVT.

OWNER

## COMMODITY

MARKETABILITY  
PRIMARY PRODUCT

PHOSPHATE

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2	RECORD 3	RECORD 4
UNDIFFERENTIATED	72,547,000	167,424,000	123,116,000	97,251,000
UNITS	MT ORE	MT ORE	MT ORE	MT ORE
YEAR/DATA	1980	1980	1980	1980

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	17.89	WT-PCT
2	P205	13.17	WT-PCT
3	P205	14.03	WT-PCT
4	P205	11.06	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORD 1: ZONA NORTE RESERVES - HORIZONTE "A" AND 80 METERS OVERBURDEN  
 RECORD 2: ZONA NORTE RESERVES - CAPA INDICE+ AND 80 METERS OVERBURDEN  
 RECORD 3: ZONA SUR RESERVES - HORIZ. SUPERIOR AND 80 METERS OVERBURDEN  
 RECORD 4: ZONA SUR RESERVES - CAPA INDICE AND 80 METERS OVERBURDEN

## SOURCE FOR ALL RECORDS:

CLARKE, GERRY. MEXICAN PHOSPHATE - A STRIVE FOR SELF-SUFFICIENCY.  
 INDUSTRIAL MINERALS NO. 152, MAY 1980, PP. 79-86.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

-----EXPLORATION METHODS-----  
 DRILLING/AERIAL RADIOMETRIC SURVEY

ORE-MINERAL IN PLACE

YEAR OF DISCOVERY: 1974

## GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSITS

TYPE OF ORE BODY: SEDIMENTARY  
MATERIAL OF ORIGIN: SEDIMENTATION  
SHAPE OF ORE BODY: TABULAR  
CONTROLLING FEATURES: BEDDING

MINERALIZED ZONE:  
STRIKE/DIP: N32W/04E

## LITHOLOGY:

SECONDIC  
BOOK TYPE:

PHOSPHORITE	IS ORE
SANDSTONE	LIES OVER ORE; LIES UNDER ORE
SHALE	LIES OVER ORE; LIES UNDER ORE
SILTSTONE	LIES OVER ORE; LIES UNDER ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
COLLOPHANE	PHOSPHATES
QUARTZ	FORMS OF SiO <sub>2</sub>
DIATOMITE	SILICATES

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME:	SAN JUAN DE LA COSTA	SEQUENCE NUMBER:	2010050015
NATION:	MEXICO	SUBDIVISION:	BAJA CALIFORNIA SUR
TYPE OF OPERATION:	SURFACE-UNDERGROUND	CURRENT STATUS:	PRODUCER
LATITUDE:	N 24 DEG 22 MIN 00 SEC	LONGITUDE:	W 110 DEG 53 MIN 00 SEC
UTM - ZONE:	12	HEMISPHERE:	NORTHERN
POINT OF REFERENCE:	ORE BODY	NORTHING:	2694672
ELEVATION:	40 METERS	EASTING:	511832
DATUM:	SEA LEVEL	PRECISION:	1 KILOMETER
		PRECISION:	10 METERS
		YEAR OF INFORMATION:	1981

OWNERSHIP	STATUS
ROCA FOSFORICA MEXICANA, S. A.	OWNER-OPERATOR
(ROFCMEX) - GOVT.	

COMMODITY	MARKETABILITY
PHOSPHATE	PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

MEASURED	RECORD 1
UNITS	50,000,000
YEAR/DATA	MT ORE
	1980

## RESERVE-RESOURCE - REMARKS

RECORD 1: AVERAGE GRADE REPORTED AS 18-20 PERCENT P205.

SOURCE FOR RECORD 1:  
 CLARKE, G. MEXICAN PHOSPHATE - A STRIVE FOR SELF-SUFFICIENCY.  
 INDUSTRIAL MINERALS NO. 152, PP. 79-85, MAY 1980.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:	-----EXPLORATION METHODS-----
GEOPHYSICAL ANOMALY	CORE DRILLING
YEAR OF DISCOVERY:	1976
YEAR OF INITIAL PRODUCTION:	1980

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
 MODE OF ORIGIN: SEDIMENTATION  
 SHAPE OF ORE BODY: TABULAR  
 CONTROLLING FEATURES: BEDDING

MINERALIZED ZONE:  
 AVERAGE THICKNESS: 3.7 METERS



TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK  
ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: MEXICO  
LATITUDE: N 24 22 00 LONGITUDE: W 110 53 00  
PERCENT SHIPPED: 100  
METHOD OF TRANSPORTATION: OCEAN  
DESTINATION FACILITY: MARKET LOCATION: MEXICO

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SALAS, G. P. SEDIMENTARY PHOSPHATE DEPOSITS IN BAJA CALIFORNIA, MEXICO. AIME 78-H-75, MARCH 1978.

MOROCCC

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: MEFAA EL ARECH

SEQUENCE NUMBER: 7140150001

NATION: MOROCCC

SUBDIVISION: KHOURIBGA

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 32 DEG 40 MIN 00 SEC

LONGITUDE: W 06 DEG 47 MIN 30 SEC

UTM - ZONE: 29 HEMISPHERE: NORTHERN

NOTHING: 3616299 EASTING: 707091

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDINGS

GOVERNMENT GRANT

ALTERNATE NAMES

SIDI EL MAATI

MERAAD EL ARECH (NORD)

MERAAD EL ARECH (SUD)

SIDI MAATI

OWNERSHIP

STATUS

OFFICE CHERIFIEN DES PHOSPHATES (GOVT.) - CCP OWNER-OPERATOR

COMMODITY

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

ORE-MINERAL IN PLACE

YEAR OF DISCOVERY: 1919

YEAR OF INITIAL PRODUCTION: 1965

-----EXPLORATION METHODS-----

SURFACE GEOLOGICAL MAPPING/DRILLING/  
CORE DRILLINGGEOLOCIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEADING

MINERALIZED ZONE:

AVERAGE DEPTH: 30.1 METERS

MINIMUM DEPTH: 15 METERS

AVERAGE THICKNESS: 7.15 METERS

**LITHOLOGY:**

GEOLOGIC AGE: TERTIARY

## ROCK TYPE:

PHOSPHORITE IS ORE

LIMESTONE LIES OVER ORE; LIES UNDER ORE

CHERT LIES OVER ORE: LIES UNDER ORE

**MINERALIZATION:**MINERAL NAME MINERAL CLASS  
FLUORAPATITE PHOSPHATESMINE/MILL INFORMATION**SURFACE MINING:**

METHOD: STRIPPING

CAPACITY: 14500

UNITS: MT. ORE/DAY

AVERAGE COVER THICKNESS: 30.1 METERS

**TRANSPORTATION (ORE):**

ORIGINATING FACILITY: MINE

LOCATION: MOROCCO

LATITUDE: N 32 40 00

LONGITUDE: W 06 47 30

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: TRUCK; CONVEYOR DISTANCE (KM): 5; 10

DESTINATION FACILITY: MILL (OFF-SITE)

LOCATION: MOROCCO

LATITUDE: N 32 46 00

LONGITUDE: W 06 47 30

**BENEFICIATION:**

METHOD: SIZING

-----DESCRIPTION OF MILLING-----  
ORE/CRUSH/SCREEN/DRY

DESIGN CAPACITY: 14500

UNITS: MT ORE/DAY

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT WT-PCT
PHOSPHATE ROCK	P205	52	32.1	

**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY: MILL (OFF-SITE)

LOCATION: MOROCCO

LATITUDE: N 32 46 00

LONGITUDE: W 06 47 30

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: RAIL

DISTANCE (KM): 149

DESTINATION FACILITY: PORT

LOCATION: CASABLANCA, MOROCCO

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: DAOUI-RECETTE 4 SEQUENCE NUMBER: 7140150002

NATION: MOROCCO  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 32 DEG 47 MIN 00 SEC  
 UTM - ZONE: 29 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY

SUBDIVISION: KHOURIRGA  
 CURRENT STATUS: PRODUCER  
 LONGITUDE: W 06 DEG 40 MIN 00 SEC  
 NORTHING: 3429487 EASTING: 718531  
 PRECISION: 1 KILOMETER  
 YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING:  
GOVERNMENT GRANTALTERNATE NAMES  
 DAOUI OPEN CAST MINE  
 RECETTE 4  
 DAOUI MINE  
 GRAND DAOUI  
 DAOUI SUD  
 DAOUI CENTRAL  
 DAOUI

OWNERSHIP	STATUS
OFFICE CHERIFIEN DES PHOSPHATES (GOVT.)-OCP	OWNER-OPERATOR
COMMODITY	MARKETABILITY
PHOSPHATE	PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 ORE-MINERAL IN PLACE

EXPLORATION METHODS-----  
 SURFACE GEOLOCICAL MAPPING/  
 CORE DRILLING

YEAR OF DISCOVERY: 1919  
 YEAR OF INITIAL PRODUCTION: 1971

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
 MODE OF ORIGIN: SEDIMENTATION  
 SHAPE OF ORE BODY: TABULAR  
 CONTROLLING FEATURES: BEDDING; LITHOLOGY

MINERALIZED ZONE:  
 AVERAGE DEPTH: 25 METERS

AVERAGE THICKNESS: 12 METERS

## LITHOLOGY:

GEOLOGIC AGE: TERTIARY  
 ROCK TYPE:  
 PHOSPHORITE IS ORE  
 LIMESTONE LIES OVER ORE; LIES UNDER ORE  
 CHERT LIES OVER ORE; LIES UNDER ORE

## MINERALIZATION:

MINERAL NAME MINERAL CLASS  
 FLUORAPATITE PHOSPHATES

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: STRIPPING  
 CAPACITY: 53000 UNITS: MT ORE/DAY

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE LOCATION: MOROCCO  
 LATITUDE: N 32 47 00 LONGITUDE: W 06 40 00  
 PERCENT SHIPPED: 100  
 METHOD OF TRANSPORTATION: TRUCK; CONVEYOR DISTANCE (KM): 5; 5  
 DESTINATION FACILITY: MILL (ON-SITE) LOCATION: MOROCCO  
 LATITUDE: N 32 47 00 LONGITUDE: W 06 40 00

## BENEFICIATION:

METHOD: WASHING -----DESCRIPTION OF MILLING-----  
 DESIGN CAPACITY: 53000 ORE/SCREEN/CRUSH/WASH/DRY/SHIP  
 UNITS: MT ORE/DAY

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	54	32.1	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: MOROCCO  
 LATITUDE: N 32 47 00 LONGITUDE: W 06 40 00  
 PERCENT SHIPPED: 100  
 METHOD OF TRANSPORTATION: RAIL DISTANCE (KM): 149  
 DESTINATION FACILITY: PORT LOCATION: CASABLANCA, MOROCCO

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: KHOURIIGA UNDERGROUND

SEQUENCE NUMBER: 7140150003

NATION: MOROCCO

SUBDIVISION: KHOURIIGA

TYPE OF OPERATION: UNDERGROUND

CURRENT STATUS: PRODUCER

LATITUDE: N 32 DEG 48 MIN 00 SEC

LONGITUDE: W 06 DEG 54 MIN 00 SEC

UTM - ZONE: 29 HEMISPHERE: NORTHERN

NORTHING: 3630877 EASTING: 696637

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 800 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

## TYPE OF MINERAL HOLDINGS

GOVERNMENT GRANT

## ALTERNATE NAMES

KHOURIIGA COMPLEX

RECETTE 2

RECETTE 7

RECETTE 8

RECETTE 9

RECETTE 10

KHOURIIGA, MORROCCO, UNDERGROUND MINE

## OWNERSHIP

OFFICE CHERIFIEN DES PHOSPHATES (GOVT.)-OCP

## STATUS

OWNER-OPERATOR

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

ORE-MINERAL IN PLACE

## -----EXPLORATION METHODS-----

DRILLING/CORE DRILLING/  
BEDROCK SAMPLING

YEAR OF DISCOVERY: 1919

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

METHOD OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDINGS; LITHOLOGY

MINERALIZED ZONE:

AVERAGE THICKNESS: 4.2 METERS

## LITHOLOGY:

GEOLOGIC AGE: TERTIARY

## ROCK TYPE:

LIMESTONE	LIES OVER ORE; LIES UNDER ORE
PHOSPHORITE	IS ORE
CHERT	LIES OVER ORE; LIES UNDER ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
FLUORAPATITE	PHOSPHATES
CALCITE	CARBONATES
QUARTZ	FORMS OF SiO <sub>2</sub>

MINE/MILL INFORMATION

## UNDERGROUND MINING:

METHOD: ROOM AND PILLAR	UNITS: MT ORE/DAY
CAPACITY: 15500	

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE	LOCATION: MOROCCO
LATITUDE: N 32 48 00	LONGITUDE: W 06 54 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: CONVEYOR	DISTANCE (KM): 6
DESTINATION FACILITY: MILL (ON-SITE)	LOCATION: MOROCCO
LATITUDE: N 32 48 00	LONGITUDE: W 06 54 00

## BENEFICIATION:

METHOD: SIZING	----- DESCRIPTION OF MILLING -----
DESIGN CAPACITY: 15500	ORE/2 STAGE SCREEN/CALCINE/DRY/SCREEN
UNITS: MT ORE/DAY	/STOCKPILE

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	67	32.3	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE)	LOCATION: MOROCCO
LATITUDE: N 32 48 00	LONGITUDE: W 06 54 00
METHOD OF TRANSPORTATION: RAIL	DISTANCE (KM): 134
DESTINATION FACILITY: PORT	LOCATION: MOROCCO

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SIDI HAJJAJ	SEQUENCE NUMBER: 7140150004
NATION: MOROCCO	SUBDIVISION: KHOURIBGA
TYPE OF OPERATION: SURFACE	CURRENT STATUS: DEVELOPING DEPOSIT
LATITUDE: N 32 DEG 56 MIN 00 SEC	LONGITUDE: W 07 DEG 16 MIN 00 SEC
UTM - ZONE: 29 HEMISPHERE: NORTHERN	NORTHING: 3645038 EASTING: 662056
POINT OF REFERENCE: ORE BODY	PRECISION: 1 KILOMETER
	YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
GOVERNMENT GRANT

OWNERSHIP OFFICE CHERIFIEN DES PHOSPHATES (GOVT.)-OCP	STATUS OWNER-OPERATOR
COMMODITY PHOSPHATE	MARKETABILITY PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD: ORE-MINERAL IN PLACE	-----EXPLORATION METHODS----- SURFACE GEOLOGICAL MAPPING/DRILLING/
YEAR OF DISCOVERY: 1919	CORE DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
MODE OF ORIGIN: SEDIMENTATION  
SHAPE OF ORE BODY: TABULAR  
CONTROLLING FEATURES: BEDDING; LITHOLOGY

MINERALIZED ZONE:  
AVERAGE DEPTH: 9.5 METERS  
AVERAGE THICKNESS: 12 METERS

LITHOLOGY:  
GEOLOGIC AGE: TERTIARY  
ROCK TYPE:  
LIMESTONE LIES OVER ORE; LIES UNDER ORE  
PHOSPHOCRITE IS ORE  
CHERT LIES OVER ORE; LIES UNDER ORE

MINERALIZATION:  
MINERAL NAME MINERAL CLASS  
FLUORAPATITE PHOSPHATES  
CALCITE CARBONATES  
QUARTZ FORMS OF SiO<sub>2</sub>

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: AL BOROUJ

SEQUENCE NUMBER: 7140150008

NATION: MOROCCO

SUBDIVISION: KHOURIBGA

TYPE OF OPERATION: UNKNOWN

CURRENT STATUS: RAW PROSPECT

LATITUDE: N 32 DEG 35 MIN 00 SEC

LONGITUDE: W 07 DEG 12 MIN 00 SEC

UTM - ZONE: 29 HEMISPHERE: NORTHERN

NORTHING: 3606336 EASTING: 668949

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING

GOVERNMENT GRANT

ALTERNATE NAMES

EL BOROUJ

OWNERSHIP

OFFICE CHERIFIEN DES PHOSPHATES (GOVT.)-OCP.

STATUS

OWNER

COMMODITY

PHOSPHATE

MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

ORE-MINERAL IN PLACE

SURFACE GEOLOGICAL MAPPING/SAMPLING/

YEAR OF DISCOVERY: 1919

DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDING; LITHOLOGY

## LITHOLOGY:

GEOLOGIC AGE: TERTIARY

RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

## ROCK TYPE:

PHOSPHORITE IS ORE

LIMESTONE LIES OVER ORE; LIES UNDER ORE

CHERT LIES OVER ORE; LIES UNDER ORE

## MINERALIZATION:

MINERAL NAME

MINERAL CLASS

FLUORAPATITE

PHOSPHATES

CHERT

FORMS OF SiO<sub>2</sub>

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: DAOUI NORD	SEQUENCE NUMBER: 7140150011
NATION: MOROCCO	SUBDIVISION: KHOURIBGA
TYPE OF OPERATION: SURFACE	CURRENT STATUS: PRODUCER
LATITUDE: N 32 DEG 46 MIN 00 SEC	LONGITUDE: W 06 DEG 33 MIN 00 SEC
UTM - ZONE: 29 HEMISPHERE: NORTHERN	NORTHING: 3627886 EASTING: 729503
POINT OF REFERENCE: ORE BODY	PRECISION: 1 KILOMETER
ELEVATION: 800 METERS	PRECISION: 100 METERS
DATUM: SEA LEVEL	YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
GOVERNMENT GRANT

ALTERNATE NAMES  
DAOUI NORD (FODSOLIZED)

OWNERSHIP	STATUS
OFFICE CHERIFIEN DES PHOSPHATES (GOVT.)-OCP	OWNER-OPERATOR

COMMODITY	MARKETABILITY
PHOSPHATE	PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:	-----EXPLORATION METHODS-----
ORE-MINERAL IN PLACE	DRILLING/BEDROCK SAMPLING
YEAR OF DISCOVERY: 1919	
YEAR OF INITIAL PRODUCTION: 1961	

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
MODE OF ORIGIN: SEDIMENTATION  
SHAPE OF ORE BODY: TABULAR  
CONTROLLING FEATURES: BEDDING; LITHOLOGY

MINERALIZED ZONE:	
AVERAGE DEPTH: 3 METERS	MINIMUM DEPTH: 0 METERS
AVERAGE THICKNESS: 4.2 METERS	

UNCONSOLIDATED MATERIAL:  
AVERAGE THICKNESS: 3 METERS

## LITHOLOGY:

GEOLOGIC AGE: TERTIARY

## ROCK TYPE:

LIMESTONE

LIES OVER ORE; LIES UNDER ORE

PHOSPHORITE

IS ORE

CHERT

LIES OVER ORE; LIES UNDER ORE

## MINERALIZATION:

MINERAL NAME

MINERAL CLASS

FLUORAPATITE

PHOSPHATES

CALCITE

CARBONATES

QUARTZ

FORMS OF SiO<sub>2</sub>MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: OPEN-PIT

UNITS: MT ORE/DAY

CAPACITY: 5000

## DESCRIPTION OF COVER:

SAND, GRAVEL

AVERAGE COVER THICKNESS: 3 METER

SLOPE OF PIT: 45 DEGREES

BENCH HEIGHT: 7.2 METERS

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE

LOCATION: MOROCCO

LATITUDE: N 32 46 00

LONGITUDE: W 06 33 00

METHOD OF TRANSPORTATION: TRUCK

DISTANCE (KM): 10

DESTINATION FACILITY: MILL (OFF-SITE)

LOCATION: MOROCCO

LATITUDE: N 32 47 00

LONGITUDE: W 06 32 00

## BENEFICIATION:

METHOD: WASHING

## -----DESCRIPTION OF MILLING-----

DESIGN CAPACITY: 5000

ORE/SCREEN/LOG WASHING/SCREEN/CYCLONE/

UNITS: MT ORE/DAY

DEWATER/FILTER/DRY STOCKPILE

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	F205	70	34.5	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (OFF-SITE)

LOCATION: MOROCCO

LATITUDE: N 32 47 00

LONGITUDE: W 06 32 00

PERCENT SHIPPED: 100

DISTANCE (KM): 174

METHOD OF TRANSPORTATION: RAIL

LOCATION: MOROCCO

DESTINATION FACILITY: PORT

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SOUTHERN KHOURIBGA REGION SEQUENCE NUMBER: 7140150012

NATION: MOROCCO

SUBDIVISION: KHOURIKGA

TYPE OF OPERATION: SURFACE

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 32 DEG 40 MIN 00 SEC

LONGITUDE: W 07 DEG 05 MIN 00 SEC

UTM - ZONE: 29 HEMISPHERE: NORTHERN

NORTHING: 3615767 EASTING: 679735

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
GOVERNMENT GRANT

## ALTERNATE NAMES

OUAD FARES

COULE FARES

KHOURIBGA RESERVES

RECETTE 10

MAZIG

EL HALASSA

CHENNANE

EL HALASSA AND CHENNANE

SIDI CHENNANE

EL HALASSA AND SIDI CHENNANE

## OWNERSHIP

## STATUS

OFFICE CHEHIFIER DES PHOSPHATES (GOVT.) - OCP

OWNER-OPERATOR

## COMMODITY

## MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

## -----EXPLORATION METHODS-----

ORE-MINERAL IN PLACE

CORE DRILLING/RECONNAISSANCE SOIL SAMPLING/

YEAR OF DISCOVERY: 1910

DETAILED SOIL SAMPLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDING

## LITHOLOGY:

GEOLOGIC AGE: TERTIARY

## ROCK TYPE:

LIMESTONE	LIES OVER ORE; LIES UNDER ORE
PHOSPHORITE	IS ORE
CHERT	LIES OVER ORE; LIES UNDER ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
FLUORAPATITE	PHOSPHATES

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: BEN GUERIR

SEQUENCE NUMBER: 7140190005

NATION: MOROCCO

SUBDIVISION: MARRAKECH

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 32 DEG 14 MIN 00 SEC

LONGITUDE: W 07 DEG 53 MIN 00 SEC

UTM - ZONE: 39 HEMISPHERE: NORTHERN

NORTHING: 3566657 EASTING: 605212

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 750 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING

GOVERNMENT GRANT

## ALTERNATE NAMES

TESSAOUT

NZALA

EL CUATA

NAZALET EL HARACHA

EAST GANTDOUF

YOUSSEOUFIA RESERVES

## OWNERSHIP

OFFICE CHERIFIEN DES PHOSPHATES (GOVT.)-OCP

## STATUS

OWNER-OPERATOR

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

UNDIFFERENTIATED	RECORD 1
UNITS	900,000,000
YEAR/JATA	MT UFE
	1968

## IN SIGHT GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	H205	20.8	WT-PCT

## RESERVE-RESOURCE - REMARKS

## SOURCE FOR RECORD 1:

TRUALL, G. BEN GUERIR. WORLD MINING, MAY 1968, PP. 24-26.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

-----+ EXPLORATION METHODS -----

RE-MINERAL IN PLACE

SUPERSURFACE GEOLOGICAL MAPPING/

YEAR OF INITIAL PRODUCTION: 1960

DRILLING/TEST PIT

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
 MODE OF ORIGIN: SEDIMENTATION  
 SHAPE OF ORE BODY: TABULAR  
 CONTROLLING FEATURES: BEDDING; LITHOLOGY

**LITHOLOGY:**

GEOLIC AGE: TERTIARY  
 ROCK TYPE:  
 LIMESTONE LIES OVER ORE; LIES UNDER ORE  
 PHOSPHORITE IS ORE  
 CHERT LIES OVER ORE; LIES UNDER ORE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS
FLUORAPATITE	PHOSPHATES
CALCITE	CARBONATES
QUARTZ	FORMS OF SiO <sub>2</sub>

MINE/MILL INFORMATION**SURFACE MINING:**

METHOD: STRIPPING	UNITS: MT ORE/DAY
CAPACITY: 12700	HARDNESS OF ORE:
DESCRIPTION OF COVER: MEDIUM-HARD ROCKS	SANDS-CONSOLIDATED ROCK

**TRANSPORTATION (ORE):**

ORIGINATING FACILITY: MINE	LOCATION: MOROCCO
LATITUDE: N 32 14 00	LONGITUDE: W 07 53 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: TRUCK	DISTANCE (KM): 2
DESTINATION FACILITY: MILL (ON-SITE)	LOCATION: MOROCCO
LATITUDE: N 32 14 00	LONGITUDE: W 07 53 00

**BENEFICIATION:**

METHOD: SIZING	----- DESCRIPTION OF MILLING -----
DESIGN CAPACITY: 12700	ORE/2 STAGE SCREEN/STOCKPILE
UNITS: MT ORE/DAY	

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
CONCENTRATE	P205	71	27.5	WT-PCT

**TRANSPORTATION FOR PRODUCT: CONCENTRATE**

ORIGINATING FACILITY: MILL (ON-SITE)	LOCATION: MOROCCO
LATITUDE: N 32 14 00	LONGITUDE: W 07 53 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: RAIL	DISTANCE (KM): 140
DESTINATION FACILITY: MILL (OFF-SITE)	LOCATION: MOROCCO

## BENEFICIATION:

METHOD: WASHING  
 DESIGN CAPACITY: 8200  
 UNITS: MT CONCENTRATE/DAY

-----DESCRIPTION OF MILLING-----  
 STOCKFILE CONCENTRATE/WASH/SCREEN/  
 STOCKFILE

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	88	30.2	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (OFF-SITE) LOCATION: MOROCCO  
 DESTINATION FACILITY: PHOSPHORIC ACID PLANT LOCATION: MOROCCO

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: MESKALA DISTRICT  
 NATION: MOROCCO  
 TYPE OF OPERATION: SURFACE  
 LATITUDE: N 31 DEG 30 MIN 00 SEC  
 UTM - ZONE: 29 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 650 METERS  
 DATUM: SEA LEVEL

SEQUENCE NUMBER: 7140190008

SUBDIVISION: MARRAKECH  
 CURRENT STATUS: EXPLORED DEPOSIT  
 LONGITUDE: W 08 DEG 30 MIN 00 SEC  
 NORTHING: 3484939 EASTING: 547483  
 PRECISION: 1 KILOMETER  
 PRECISION: 500 METERS  
 YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
 GOVERNMENT GRANT

## ALTERNATE NAMES

CHICHAGUA DEPOSIT  
 IMI N° TANOUTE DEPOSIT  
 GULAD BOU SPAA  
 ENFIFA  
 CHICHAGUA  
 IMI N° TANOUTE  
 THE MESKALA

OWNERSHIP	STATUS
OFFICE CHERIFIEN DES PHOSPHATES (GOVT.)-OCP	OWNER

COMMODITY	MARKETABILITY
PHOSPHATE	PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

UNDIFFERENTIATED	RECORD 1
UNITS	20,000,000,000
YEAR/DATA	MT ORE
	1976

## RESERVE-RESOURCE - REMARKS

## SOURCE FOR RECORD 1:

ENGINEERING AND MINING JOURNAL. SPAIN MAY JOIN MOROCCO IN MESKALA PHOSPHATES. JULY 1976, P. 27.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 ORE-MINERAL IN PLACE  
 YEAR OF DISCOVERY: 1908

-----EXPLORATION METHODS-----  
 DRILLING/BEDROCK SAMPLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
MODE OF ORIGIN: SEDIMENTATION  
SHAPE OF ORE BODY: TABULAR  
CONTROLLING FEATURES: FAULTING; FOLDING

MINERALIZED ZONE:  
AVERAGE DEPTH: 5 METERS MINIMUM DEPTH: 2 METERS  
AVERAGE THICKNESS: 2.5 METERS

UNCONSOLIDATED MATERIAL:  
AVERAGE THICKNESS: 5 METERS MINIMUM THICKNESS: 2 METERS

LITHOLOGY:  
GEOLOGIC AGE: TERTIARY

ROCK TYPE:  
LIMESTONE LIES OVER ORE; LIES UNDER ORE  
CHERT LIES OVER ORE; LIES UNDER ORE  
PHOSPHORITE IS ORE

MINERALIZATION:  
MINERAL NAME MINERAL CLASS  
FLUORAPATITE PHOSPHATES  
CALCITE CARBONATES  
QUARTZ FORMS OF SiO<sub>2</sub>

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14, VIENNA, 1977.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: YOUSSEUFIA WHITE ROCK

SEQUENCE NUMBER: 7140330001

NATION: MOROCCO

SUBDIVISION: SAFI

TYPE OF OPERATION: UNDERGROUND

CURRENT STATUS: PRODUCER

LATITUDE: N 32 DEG 17 MIN 00 SEC

LONGITUDE: W 08 DEG 20 MIN 00 SEC

UTM - ZONE: 29 HEMISPHERE: NORTHERN

NORTHING: 3571848 EASTING: 562777

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 750 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING

GOVERNMENT GRANT

## ALTERNATE NAMES

BOU TRETICH

SIDI BOU TRETICH

YOUSSEUFIA DISTRICT

RECETTE 3

RECETTE 4

RECETTE 5

RECETTE 6

## OWNERSHIP

OFFICE CHERIFIEN DES PHOSPHATES (GOVT.)-OCP

## STATUS

OWNER-OPERATOR

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

ORE-MINERAL IN PLACE

## -----EXPLORATION METHODS-----

SURFACE GEOLOGICAL MAPPING/DRILLING/  
DETAILED SOIL SAMPLINGGEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDING; LITHOLOGY

## MINERALIZED ZONE:

AVERAGE DEPTH: 50 METERS

MINIMUM DEPTH: 0 METERS

AVERAGE THICKNESS: 2.4 METERS

**LITHOLOGY:**

GEOLOGIC AGE: TERTIARY

ROCK TYPE:

LIMESTONE	LIES OVER ORE; LIES UNDER ORE
PHOSPHORITE	IS ORE
CHERT	LIES OVER ORE; LIES UNDER ORE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS
FLUORAPATITE	PHOSPHATES
CALCITE	CARBONATES
QUARTZ	FORMS OF SiO <sub>2</sub>

MINE/MILL INFORMATION  
MULTIPLE MINES FEED MILL**UNDERGROUND MINING:**METHOD: CONTINUOUS MINING; ROOM AND PILLAR;  
SHORTWALL MINING; LONGWALL MINING

CAPACITY: 16700 UNITS: MT ORE/DAY

**TRANSPORTATION (ORE):**

ORIGINATING FACILITY: MINE	LOCATION: MOROCCO
LATITUDE: N 32 17 00	LONGITUDE: W 08 20 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: CONVEYOR	DISTANCE (KM): 3
DESTINATION FACILITY: MILL (OFF-SITE)	LOCATION: MOROCCO
LATITUDE: N 32 15 00	LONGITUDE: W 08 32 00

**BENEFICIATION:**

METHOD: SIZING	----- DESCRIPTION OF MILLING -----
DESIGN CAPACITY: 26500	ORE/2 STAGE SCREEN/DRY STOCKPILE
UNITS: MT ORE/DAY	

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	66	31	WT-PCT

**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY: MILL (OFF-SITE)	LOCATION: MOROCCO
LATITUDE: N 32 15 00	LONGITUDE: W 08 32 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: RAIL	DISTANCE (KM): 75
DESTINATION FACILITY: PORT	LOCATION: MOROCCO

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SURFACE MINER. BUCYRUS ERIE, PHOSPHATE, A BIG BUSINESS IN MOROCCO. C. 1974, PP. 6-7.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: YOUSOUFIA BLACK ROCK

SEQUENCE NUMBER: 7140330004

NATION: MOROCCO

SUBDIVISION: SAFI

TYPE OF OPERATION: UNDERGROUND

CURRENT STATUS: PRODUCER

LATITUDE: N 32 DEG 15 MIN 00 SEC

LONGITUDE: W 08 DEG 27 MIN 00 SEC

UTM - ZONE: 29 HEMISPHERE: NORTHERN

NORTHING: 3568091 EASTING: 551810

POINT OF REFERENCE: CRE BODY

PRECISION: 1 KILOMETER

ELEVATION: 750 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING

GOVERNMENT GRANT

## ALTERNATE NAMES

YOUSOUFIA DISTRICT

RECETTE 7

RECETTE 8

RECETTE 9

RECETTE 10

ZONE NOYLE

FLOODED SECTOR

## OWNERSHIP

OFFICE CHERIFIEN DES PHOSPHATES (GOVT.)-OCP

## STATUS

OWNER-OPERATOR

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

## -----EXPLORATION METHODS-----

CRE-MINERAL IN PLACE

DRILLING

YEAR OF INITIAL PRODUCTION: 1974

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF CRE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF CRE BODY: TABULAR

CONTROLLING FEATURES: BEDDING; LITHOLOGY

## MINERALIZED ZONE:

AVERAGE DEPTH: 80 METERS

MINIMUM DEPTH: 20 METERS

AVERAGE THICKNESS: 2.4 METERS

## LITHOLOGY:

GEOLOGIC AGE: TERTIARY

## ROCK TYPE:

CHERT	LIES OVER ORE; LIES UNDER ORE
LIMESTONE	LIES OVER ORE; LIES UNDER ORE
PHOSPHORITE	IS ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
FLUORAPATITE	PHOSPHATES
QUARTZ	FORMS OF SiO <sub>2</sub>

MINE/MILL INFORMATION

## UNDERGROUND MINING:

METHOD: LONGWALL CAVING; CONTINUOUS MINING; SHORTWALL MINING	
CAPACITY: 5300	UNITS: MT ORE/DAY

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE	LOCATION: MOROCCO
LATITUDE: N 32 15 00	LONGITUDE: W 08 27 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: CONVEYOR	DISTANCE (KM): 3
DESTINATION FACILITY: MILL (ON-SITE)	LOCATION: MOROCCO
LATITUDE: N 32 15 00	LONGITUDE: W 08 27 00

## BENEFICIATION:

METHOD: CALCINING	----- DESCRIPTION OF MILLING -----
DESIGN CAPACITY: 5300	ORE/SCREEN/CALCINE/DRY/STOCKPILE/SHIP
UNITS: MT ORE/DAY	

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	63	34	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE)	LOCATION: MOROCCO
LATITUDE: N 32 15 00	LONGITUDE: W 08 27 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: RAIL	DISTANCE (KM): 75
DESTINATION FACILITY: PORT	LOCATION: SAFI, MOROCCO

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SURFACE MINER. CYRUS ERIE, PHOSPHATE, A BIG BUSINESS IN MOROCCO.  
1974, PP. 6-7.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: YOUSSEOUFIA OPEN CAST

SEQUENCE NUMBER: 7140330005

NATION: MOROCCO

SUBDIVISION: SAFI

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 32 DEG 15 MIN 00 SEC

LONGITUDE: W 08 DEG 32 MIN 00 SEC

UTM - ZONE: 29 HEMISPHERE: NORTHERN

NORTHING: 3568053 EASTING: 543960

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 750 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING

GOVERNMENT GRANT

ALTERNATE NAMES

YOUSSEOUFIA DISTRICT

RECETTE 5

RECETTE 6

OWNERSHIP

OFFICE CHERIFIEN DES PHOSPHATES (GOVT.)- OCP

STATUS

OWNER-OPERATOR

COMMODITY

PHOSPHATE

MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

-----EXPLORATION METHODS-----

ORE-MINERAL IN PLACE

SURFACE GEOLOGICAL MAPPING/CORE DRILLING/

YEAR OF INITIAL PRODUCTION:

DETAILED SOIL SAMPLING/TEST SHAFT

PRIOR TO 1965

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDING; LITHOLOGY

MINERALIZED ZONE:

AVERAGE DEPTH: 8.7 METERS

MINIMUM DEPTH: 0 METERS

AVERAGE THICKNESS: 2.6 METERS

UNCONSOLIDATED MATERIAL:

AVERAGE THICKNESS: 8.7 METERS

MINIMUM THICKNESS: 0 METERS

**LITHOLOGY:**

GEOLOGIC AGE: TERTIARY  
 ROCK TYPE:  
 CHEFT LIES OVER ORE; LIES UNDER ORE  
 PHOSPHCRITE IS ORE  
 LIMESTONE LIES OVER ORE; LIES UNDER ORE  
 MARLS LIES OVER ORE; LIES UNDER ORE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS
FLUORAPATITE	PHOSPHATES
QUARTZ	FORMS OF SiO <sub>2</sub>

**MINE/MILL INFORMATION**  
MULTIPLE MINES FEED MILL**SURFACE MINING:**

METHOD: OPEN-PIT	UNITS: MT ORE/DAY
CAPACITY: 9800	HARDNESS OF ORE:
DESCRIPTION OF COVER: SAND, GRAVEL	SANDS-CONSOLIDATED ROCK
AVERAGE COVER THICKNESS: 8.7 METERS	
BENCH HEIGHT: 10 METERS	

**TRANSPORTATION (ORE):**

ORIGINATING FACILITY: MINE	LOCATION: MOROCCO
LATITUDE: N 32 15 00	LONGITUDE: W 08 32 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: CONVEYOR	DISTANCE (KM): 5
DESTINATION FACILITY: MILL (ON-SITE)	LOCATION: MOROCCO
LATITUDE: N 32 15 00	LONGITUDE: W 08 32 00

**ENRICHMENT:**

METHOD: SIZING	----- DESCRIPTION OF MILLING -----
DESIGN CAPACITY: 26500	ORE/2 STAGES SCREENING/DRY STOCKPILE
UNITS: MT ORE/DAY	

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	F205	66	31.2	WT-PCT

**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY: MILL (ON-SITE)	LOCATION: MOROCCO
LATITUDE: N 32 15 00	LONGITUDE: W 08 32 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: RAIL	DISTANCE (KM): 75
DESTINATION FACILITY: PORT	LOCATION: MOROCCO

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PHOSPHORUS & POTASSIUM. FURTHER DETAILS OF OCP'S PLANS FOR THE FUTURE. NO. 106, MAR/APR, 1980, PP. 34-43.

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PHOSPHORUS & POTASSIUM. FURTHER DETAILS OF OCP'S PLANS FOR THE FUTURE. NO. 112, 1981, PP. 18-21.

SURFACE MINER. BUCYRUS ERIE, PHOSPHATE, A BIG BUSINESS IN MOROCCO. C. 1974, PP. 6-7.

NAUFILOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: NAUFI ISLAND

SEQUENCE NUMBER: 6170000001

NATION: NAURU

SUBDIVISION: NOT SUBDIVIDED

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: S 00 DEG 32 MIN 00 SEC

LONGITUDE: E 166 DEG 56 MIN 00 SEC

UTM - ZONE: 58 HEMISPHERE: SOUTHERN

NORTHING: 9941020 EASTING: 715165

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 35 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

OWNERSHIP

STATUS

NAUFI PHOSPHATE CORPORATION

OWNER-OPERATOR

COMMODITY

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

RECORD 1

MEASURED 25,000,000

INDICATED 5,000,000

UNITS MT ORE

YEAR/DATA 1980

## RESERVE-RESOURCE - REMARKS

RECORD 1: HIGH-GRADE PHOSPHATE ORE (82-90 PERCENT BONE PHOSPHATE OF LIME).

SOURCE FOR RECORD 1:

SRI INTERNATIONAL. CHEMICAL ECONOMICS HANDBOOK, MARCH 1980.

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1900

YEAR OF INITIAL PRODUCTION: 1907

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: IRREGULAR

MINERALIZED ZONE:

MINIMUM DEPTH: 0.05 METER

AVERAGE THICKNESS: 7.6 METERS

## UNCONSOLIDATED MATERIAL:

MINIMUM THICKNESS: 0.05 METER

## LITHOLOGY:

GEOLOGIC AGE: PLEISTOCENE

ROCK TYPE:

PHOSPHORITE IS ORE

LIMESTONE LIES ALONG ORE; LIES UNDER ORE

## MINERALIZATION:

MINERAL NAME MINERAL CLASS  
APATITE PHOSPHATESMINE/MILL INFORMATION

## SURFACE MINING:

METHOD: STRIPPING

CAPACITY: 7200

UNITS: MT ORE/DAY

DESCRIPTION OF COVER:

SAND, SILT

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE

LOCATION: NAURU

LATITUDE: S 00 32 00

LONGITUDE: E 166 56 00

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: TRUCK; RAIL DISTANCE (KM): 2; 4

DESTINATION FACILITY: MILL (OFF-SITE) LOCATION: NAURU

## BENEFICIATION:

METHOD: SIZING

-----DESCRIPTION OF MILLING-----

DESIGN CAPACITY: 7200

ORE FEED/SCREEN/CRUSH/2ND SCREEN/2ND CRUSH/

UNITS: MT ORE/DAY

DRY/SCREEN/CRUSH/PELLETIZE/PHOSPHATE PRODUCT

PRODUCT ASSAY FORM RECOVERY CONCENTRATE GRADE UNIT  
PHOSPHATE ROCK P205 93 38.8 WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (OFF-SITE) LOCATION: NAURU

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: OCEAN

DESTINATION FACILITY: MARKET

BIBLIOGRAPHY RECORDS

BRITISH SULPHUR CORP. WORLD SURVEY OF PHOSPHATE DEPOSITS. 3RD EDITION, 1973.

\_\_\_\_\_. WORLD SURVEY OF PHOSPHATE DEPOSITS. 4TH EDITION, 1980.

SFI INTERNATIONAL. CHEMICAL ECONOMICS HANDBOOK, MARCH 1980.

COMMONWEALTH INSTITUTE. COMMONWEALTH FACT SHEET. NAURU, 1975.

PHOSPHORUS & POTASSIUM. THE NAURU PHOSPHATE INDUSTRY. BRITISH SULPHUR CORP., 1972.

WORLD MINING. D.R.I., 1980.

PAKISTANLOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: HAZARA

SEQUENCE NUMBER: 5350150016

NATION: PAKISTAN

SUEDIVISION: NORTH WEST FRONTIER  
CURRENT STATUS: EXPLORED DEPOSIT  
LONGITUDE: E 73 DEG 12 MIN 00 SEC  
NORTHING: 3787449 EASTING: 334183TYPE OF OPERATION: UNDERGROUND  
LATITUDE: N 34 DEG 13 MIN 00 SEC  
UTM - ZONE: 43 HEMISPHERE: NORTHERN  
POINT OF REFERENCE: ORE BODY  
ELEVATION: 1600 METERS  
DATUM: SEA LEVELPRECISION: 100 METERS  
YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

KAKUL (KAKIL, KAKOOL)  
LAGARBAN

## OWNERSHIP

GOVERNMENT OF PAKISTAN  
INDUSTRIAL MINERAL ENTERPRISES

## STATUS

OWNER  
OPERATOR

## COMMODITY

PHOSPHATE

MARKETABILITY  
PRIMARY PRODUCTPUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2
INFERRED	500,000	14,000,000
UNITS	MT ORE	MT ORE
YEAR/DATA	1979	1979

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	28.5	WT-PCT
2	P205	27	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORD 1: RESERVES ATTRIBUTED TO THE KAKUL DEPOSIT.

RECORD 2: RESERVES ATTRIBUTED TO THE LAGARBAN DEPOSIT.

## SOURCE FOR RECORDS 1 AND 2:

WORLD MINING DIRECTORY. PAKISTAN. NUMBER 1979, AUGUST 1979.

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1970

-----EXPLORATION METHODS-----  
CORE DRILLINGGEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: LITHOLOGY

MINERALIZED ZONE:

AVERAGE THICKNESS: 2 METERS

## LITHOLOGY:

NAME OF FORMATION:	ABOTTABAD	GEOLOGIC AGE:	LOWER CAMBRIAN
ROCK TYPE:			
PHOSPHORITE	IS CRE		
DOLOMITE	LIES OVER CRE; LIES UNDER CRE		

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
COLLOPHANE	PHOSPHATES
DAHLITE	PHOSPHATES
FRANCOLITE	PHOSPHATES
DOLOMITE	CARBONATES

BIBLIOGRAPHY RECORDS

ASARULLAH. PHOSPHATE, POTASH AND NATURAL GAS OCCURRENCES IN PAKISTAN.  
IN: LEE, A.I. (EDITOR), FERTILIZER MINERAL OCCURRENCES IN THE  
ASIA-PACIFIC REGION, FEBRUARY 1980, PP. 66-67.

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F. 174.

COOK, F. J. AND J. H. SHERGOLD (EDITORS). PROTEROZOIC AND CAMBRIAN  
PHOSPHORITES. REPORT ON THE FIRST INTERNATIONAL MEETING OF IGCP PROJECT  
156, ANU PRESS, CANBERRA, 106 PP.

INDUSTRIAL MINERALS. PAKISTAN: GREEN LIGHT FOR PO<sub>4</sub> PROJECT. APRIL  
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SHELDON, R. P. AND W. C. BURNETT (EDITORS). FERTILIZER MINERAL POTENTIAL  
IN ASIA AND THE PACIFIC. PROCEEDINGS OF THE FERTILIZER RAW MATERIALS  
RESOURCES WORKSHOP, AUGUST 20-24, 1979, HONOLULU, HAWAII, 477 PP.

SPATE, O. H. K. INDIA AND PAKISTAN: A GENERAL AND REGIONAL GEOGRAPHY.  
SECOND EDITION, 1957, 829 PP.

WORLD MINING CATALOG. PAKISTAN. SURVEY AND DIRECTORY NUMBER 1980,  
AUGUST 1980, F. 204.

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AUGUST 1981, PP. 145, 146.

WORLD MINING DIRECTORY. PAKISTAN. NUMBER 1979, AUGUST 1979.

PERU

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: BAYOVAR                    SEQUENCE NUMBER: 3330370001  
NATION: PERU                            SUBDIVISION: PIURA  
TYPE OF OPERATION: SURFACE            CURRENT STATUS: DEVELOPING DEPOSIT  
LATITUDE: S 05 DEG 50 MIN 15 SEC      LONGITUDE: W 81 DEG 02 MIN 15 SEC  
UTM - ZONE: 17    HEMISPHERE: SOUTHERN    NORTHING: 9354799    EASTING: 495848  
POINT OF REFERENCE: ORE BODY        PRECISION: 1 KILOMETER  
ELEVATION: -14 METERS                PRECISION: 10 METERS  
DATUM: SEA LEVEL                      YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
STATE LEASE; MINERALS ONLY

ALTERNATE NAMES  
PROBAYOVAR  
SECHURA DESERT

**COMMODITY** **MARKETABILITY**  
**PHOSPHATE** **PRIMARY PRODUCT**

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD: -----EXPLORATION METHODS-----  
CRE-MINERAL IN PLACE MAPPING/CORE DRILLING/TRENCHING  
YEAR OF DISCOVERY: 1958

## GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
MODE OF ORIGIN: SEDIMENTATION  
SHAPE OF ORE BODY: TABULAR  
CONTROLLING FEATURES: FAULTING

## LITHOLOGY:

NAME OF FORMATION: ZAPAYAL FORMATION GEOLOGIC AGE: MIOCENE  
DEFORMATION DESCRIPTION: FAULTING  
RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION  
ROCK TYPE:

REVIEW ARTICLE

PHOSPHORITE	LIES OVER ORE
SANDSTONE	LIES OVER ORE; LIES UNDER ORE
SAND	LIES OVER ORE; LIES UNDER ORE
OTHER PELAGIC SEDIMENTS	LIES OVER ORE; LIES UNDER ORE

## MINERALIZATION:

MINERAL NAME  
APATITE  
DIATOMITE  
GYPSUM

MINERAL CLASS  
PHOSPHATES  
SILICATES  
SULFATES & CHROMATES

BIBLIOGRAPHY RECORDS

BRITISH SULPHUR. WORLD SURVEY OF PHOSPHATES. 4TH EDITION 1980.

CHENEY, M T ET AL. THE SECHURA PHOSPHATE DEPOSITS OF PERU. ECON.  
GEOLOGY, VOL. 74, NO. 2, 1979.

SAUDI ARABIALOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: WEST THANIYAT	SEQUENCE NUMBER: 5170000005
NATION: SAUDI ARABIA	SUBDIVISION: NOT SUBDIVIDED
TYPE OF OPERATION: UNDERGROUND	CURRENT STATUS: EXPLORED DEPOSIT
LATITUDE: N 29 DEG 45 MIN 00 SEC	LONGITUDE: E 38 DEG 02 MIN 45 SEC
UTM - ZONE: 37 HEMISPHERE: NORTHERN	NORTHING: 3291286 EASTING: 407739
POINT OF REFERENCE: ORE BODY	PRECISION: 1 KILOMETER
	YEAR OF INFORMATION: 1981

ALTERNATE NAMES  
 THANIYAT AREA  
 THANIYAT-TURAYF

TYPE OF MINERAL HOLDING  
 GOVERNMENT CONTROLLED

OWNERSHIP  
 SAUDI ARABIA (PETROMIN)  
 GRANGES (OF SWEDEN)

STATUS  
 OWNER  
 OWNER

COMMODITY  
 PHOSPHATE

MARKETABILITY  
 PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

UNDIFFERENTIATED	RECORD 1
UNITS	225,000,000
YEAR/DATA	MT ORE
	1980

RESERVE-RESOURCE - REMARKS

RECORD 1: RESERVES WERE REPORTED BETWEEN 150 AND 300 MILLION MT.

SOURCE FOR RECORD 1:  
 BRITISH SULPHUR. WORLD SURVEY OF PHOSPHATE DEPOSITS. 4TH  
 EDITION, 1980.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:  
 ORE-MINERAL IN PLACE  
 YEAR OF DISCOVERY: 1965

-----EXPLORATION METHODS-----  
 SAMPLING/ CORE DRILLING

## GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY; DISSEMINATED  
MODE OF ORIGIN: SEDIMENTATION  
SHAPE OF ORE BODY: LENTICULAR  
CONTROLLING FEATURES: LITHOLOGY  
DEGREE OF WALL ROCK ALTERATION: NONE

**MINERALIZED ZONE:**

MINIMUM DEPTH: 20 METERS

AVERAGE THICKNESS: 1.65 METERS

## UNCONSOLIDATED MATERIAL:

MINIMUM THICKNESS: 20 METERS

## LITHOLOGY:

NAME OF FORMATION: ARUMA SANDSTONE

GEOLOGIC AGE: LOWER CRETACEOUS

## DEFORMATION DESCRIPTION: FAULTING

FOCK TAY

## LIES OVER CRE

## LIES OVER CREDIT; LIES UNDER CREDIT

IS CRE

LIES OVER ORE; LIES UNDER ORE

## LIES UNDER ORE

## **MINERALIZATION:**

MINERAL NAME  
APATITE

## MINERAL CLASS

## GRAIN SIZE

## PHANERITIC-FINE

## SIRILOGRAPHY RECORDS

BRITISH SULPHUR. WORLD SURVEY OF PHOSPHATE DEPOSITS. 4TH EDITION, 1980.

CATHCART, J. B. TEXTURE AND COMPOSITION OF OUTCROPPING PHOSPHORITE IN THE TURAYF REGION, NORTHERN SAUDI ARABIA. U.S. GEOLOGICAL SURVEY PROFESSIONAL PAPER 600-C, PP. C4-C12.

JACK, J. I., ET AL. CORING SOFT PHOSPHORITE USING AIR FLUSHING. WORLD MINING, APRIL 1961, PP. 44-51.

MEISSNER, C. R., JR. PHOSPHATE DEPOSITS IN THE SIRHAN-TURAYF BASIN. IN MINERAL RESOURCES RESEARCH, 1967-1968, PP. 52-52, SAUDI ARABIA. MIN. PETROL. MINER. RESOUR., JIDDAH, 1969.

MINING MAGAZINE. SAUDI ARABIAN EXPLORATION. NOVEMBER 1975, P. 743.

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WORLD MINING. SAUDI ARABIA. CATALOG AND DIRECTORY #1980.

CORLD MINING. SAUDI ARABIA. CATALOG AND DIRECTORY #1981.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: TURAYF

SEQUENCE NUMBER: 5170000007

NATION: SAUDI ARABIA

SUBDIVISION: NOT SUBDIVIDED

TYPE OF OPERATION: UNKNOWN

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 31 DEG 40 MIN 00 SEC

LONGITUDE: E 39 DEG 13 MIN 00 SEC

UTM - ZONE: 37 HEMISPHERE: NORTHERN

NORTHING: 3503323 EASTING: 520539

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

YEAR OF INFORMATION: 1981

OWNERSHIP

STATUS

SAUDI ARABIA

OWNER

COMMODITY

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2
INFERRED	1,100,000,000	85,000,000
UNITS	MT ORE	MT ORE
YEAR/DATA	1969	1969

IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	16	WT-PCT
2	P205	17.8	WT-PCT

RESERVE-RESOURCE - REMARKS

SOURCE FOR RECORDS 1 AND 2:

MEISSNER, C. R., JR. PHOSPHATE DEPOSITS IN THE SIRHAN-TURAYF BASIN. IN: MINERAL RESOURCES RESEARCH, 1967-68, PP. 52-53, SAUDI-ARABIA, MIN. PETROL. MINER. RESOUR., JIDDAH, 1969.

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1965

-----EXPLORATION METHODS-----  
CORE DRILLINGGEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSITTYPE OF ORE BODY: SEDIMENTARY  
MODE OF ORIGIN: SEDIMENTATION

MINERALIZED ZONE:

STRIKE: N90E

AVERAGE THICKNESS: 71 METERS

LITHOLOGY:

NAME OF FORMATION: HIBR

GEOLOGIC AGE: EOCENE

ROCK TYPE:

PHOSPHORITE

IS ORE

LIMESTONE

NEAR ORE

CHERT

NEAR ORE

CLAY

NEAR ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
COLLOPHANE	PHOSPHATES
CHERT	FORMS OF $\text{SiO}_2$
CALCITE	CARBONATES

BIBLIOGRAPHY RECORDS

BRITISH SULPHUR. WORLD SURVEY OF PHOSPHATE DEPOSITS. 4TH EDITION, 1980.

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MEISSNER, C. R., JR. PHOSPHATE DEPOSITS IN THE SIRHAN-TURAYF BASIN. IN: MINERAL RESOURCES RESEARCH, 1967-68, PP. 52-53, SAUDI ARABIA, MIN. PETROL. MINER. RESOUR., JIDDAH, 1969.

SENEGALLOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: PALLO (THIES)

SEQUENCE NUMBER: 7440350001

NATION: SENEGAL

SUBDIVISION: THIES

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 14 DEG 48 MIN 00 SEC

LONGITUDE: W 17 DEG 05 MIN 00 SEC

UTM - ZONE: 28 HEMISPHERE: NORTHERN

NCRTHING: 1637146 EASTING: 275773

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 75 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

## OWNERSHIP

## STATUS

SOCIETE SENEGALAISE DES PHOSPHATES DE THIES

OPERATOR

SENEGALESE GOVERNMENT

OWNER

RHONE-POULENC OF FRANCE

OWNER

## COMMODITY

## MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

RECORD 1

MEASURED 50,000,000  
 INDICATED 50,000,000  
 UNITS MT ORE  
 YEAR/DATA 1981

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	26.7	WT-PCT

## RESERVE-RESOURCE - REMARKS

## SOURCE FOR RECORD 1:

BRITISH SULFUR CORPORATION. WORLD SURVEY OF PHOSPHATE DEPOSITS,  
 1980.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

## -----EXPLORATION METHODS-----

ORE-MINERAL IN PLACE

GEOLOGICAL/DRILLING

YEAR OF INITIAL PRODUCTION: 1953

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDING

## MINERALIZED ZONE:

AVERAGE DEPTH: 3 METERS  
 AVERAGE THICKNESS: 17 METERS

## UNCONSOLIDATED MATERIAL:

AVERAGE THICKNESS: 3 METERS

## LITHOLOGY:

NAME OF FORMATION: UPPER LUTETIAN                    GEOLOGIC AGE: EOCENE  
 ROCK TYPE:  
 UNSPECIFIED SEDIMENTARY                                IS ORE

## MINERALIZATION:

MINERAL NAME    MINERAL CLASS  
 LAVELLITE    PHOSPHATES

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: STRIPPING  
 CAPACITY: 1964  
 DESCRIPTION OF COVER:  
 SAND, SILT  
 AVERAGE COVER THICKNESS: 3 METERS

UNITS: MT ORE/DAY  
 HARDNESS OF ORE:  
 HARD ROCKS

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE  
 LATITUDE: N 14 48 00  
 PERCENT SHIPPED: 100  
 METHOD OF TRANSPORTATION: TRUCK  
 DESTINATION FACILITY: MILL (OFF-SITE)

LOCATION: PALLO (THEIS) PIT  
 LONGITUDE: W 17 05 00  
 DISTANCE (KM): 9  
 LOCATION: LAM LAM

## BENEFICIATION:

METHOD: SIZING  
 DESIGN CAPACITY: 1964  
 UNITS: MT ORE/DAY

----- DESCRIPTION OF MILLING -----  
 ORE/CRUSH/VIBRATING SCREEN/30% CALCINATED

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	94	28.0	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (OFF-SITE)                    LOCATION: LAM LAM  
 PERCENT SHIPPED: 100  
 METHOD OF TRANSPORTATION: RAIL  
 DESTINATION FACILITY: PORT                                LOCATION: DAKAR

BIBLIOGRAPHY RECORDS

AMERICAN EMBASSY DAKAR. MINERALS: THE PHOSPHATE MINING INDUSTRY OF SENEGAL. MARCH 7, 1966.

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CAPE, J.J. WORLD PHOSPHATE STUDY DEPOSIT EVALUATION, SENEGAL. DECEMBER 1980.

INTERNATIONAL URANIUM RESOURCES EVALUATION (IUREP). SENEGAL. NO. 16, AIEA, VIENNA, 1980.

LOUIS, P.L. PHOSPHATE ROCK PRODUCTION IN ALGERIA, SENEGAL AND TOGO: PRESENT SITUATION AND PROSPECTS. DECEMBER 1979, PP. 20-24.

MINERAL TRADE NOTES. V. 73, NO. 4, P. 7.

MINING ANNUAL REVIEW, SENEGAL. 1980.

WORLD MINING DIRECTORY. SENEGAL. NO. 1979.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: TAIBA

SEQUENCE NUMBER: 7440350002

NATION: SENEGAL

SUBDIVISION: THIES

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 15 DEG 00 MIN 00 SEC

LONGITUDE: W 17 DEG 25 MIN 00 SEC

UTM - ZONE: 28 HEMISPHERE: NORTHERN

NORTHING: 1659643 EASTING: 240119

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 10 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

KEUR-MOR-FALL

N'DOMCR-LIUP

TURENE

## OWNERSHIP

COMPAGNIE SENECALEISE DE PHOSPHATES DE TAIBA

## STATUS

OPERATOR

SENEGALESE GOVERNMENT

OWNER

ERGM (FRANCE)

OWNER

INTERNATIONAL MINERALS &amp; CHEMICALS CORP.

OWNER

NOUVELLE CIE FINANCIERE POUR L'OUTRE-MER

OWNER

UNKNOWN OWNERS

OWNER

## COMMUNITY

## MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2
MEASURED	370,000,000	-----
INFERRRED	-----	75,000,000
UNITS	MT ORE	MT ORE
YEAR/DATA	1979	1980

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	27	WT-PCT
2	P205	27	WT-PCT

## RESERVE-RESOURCE - REMARKS

## SOURCE FOR RECORD 1:

CHELDRICK, W. F. AND H. STIER. WORLD PHOSPHATE SURVEY. WORLD BANK, SEPT. 1979, PP. 74-77.

## SOURCE FOR RECORD 2:

BLAKE, T. A. AND R. FORTILLO. PHOSPHATE ROCK. CEH MARKETING RESEARCH REPORT - SRI INTERNATIONAL. MARCH 1980.

DEPOSIT\_HISTORICAL\_INFORMATION

DISCOVERY METHOD:  
ORE-MINERAL IN PLACE  
YEAR OF DISCOVERY: 1945  
YEAR OF INITIAL PRODUCTION: 1960

----- EXPLORATION METHODS -----  
CORE DRILLING

## GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION  
SHAPE OF ORE BODY: TABULAR  
CONTROLLING FEATURES: BEDDING

**MINERALIZED ZONE:**

AVERAGE DEPTH: 25 METERS MINIMUM DEPTH: 20 METERS  
AVERAGE THICKNESS: 6 METERS

**UNCONSOLIDATED MATERIAL:**

AVERAGE THICKNESS: 25 METERS      MINIMUM THICKNESS: 20 METERS

## LITHOLOGY:

NAME OF FORMATION: CLAIBORNE FORMATION GEOLOGIC AGE: EOCENE

NAME :  
BOOK TYPE :

PHOSPHORITE	IS ORE
CHEART	GANGUE
LIMESTONE	GANGUE
CLAY	GANGUE

### MINERALIZATION:

MINERAL NAME	MINERAL CLASS
FLUORAPATITE	PHOSPHATES
CRANDALLITE	PHOSPHATES

## MINE/MILL INFORMATION

## SURFACE MINING:

#### **METHOD: STRIPPING**

PERIOD: SHIFT IN  
CAPACITY: 22000

**DESCRIPTION OF COVER:**

DESCRIPTION  
SAND - SILT

UNITS: MT ORE/DAY

#### **TRANSPORTATION (OPEN):**

TRANSPORTATION (ORE).  
ORIGINATING FACILITY: MINE

ORIGINATING FACILITY:  
LATITUDE: N 15 00.00

LATITUDE: N 15 00 U  
PERCENT CHUBBER: 100

METHOD OF TRANSPORTATION: TRUCKS & PIPELINE

METHOD OF TRANSPORTATION: TRUCK; PIPE  
TRANSMISSION FACILITIES: N/A; 1055' SITE

LOCATION: TAIBA BAY

LOCATION: TAIBA PIT  
LONGITUDE: W 132° 26' 00"

## BENEFICIATION:

METHOD: FLOTATION ----- DESCRIPTION OF MILLING -----  
 DESIGN CAPACITY: 22000 TONNES/DAY C.R./WASH/GRIND/FLOTATION/DEWATERING FILTERS  
 UNITS: MT C.R./DAY ROTARY DRYER/STOCKPILE/LOADOUT

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	F205	32	37.9	WT-PCT

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (OFF-SITE)

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: RAIL

DESTINATION FACILITY: PORT LOCATION: DAKAR

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CATHCART, J. B. URANIUM IN PHOSPHATE ROCK. U.S.G.S. OPEN-FILE REPORT. 75-321, 1975, 20 P.

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SHELDRICK, W. F., AND H. STIER. WORLD PHOSPHATE SURVEY. WORLD BANK, SEPT. 1974, FF. 74-77.

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SOUTH AFRICALOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: PALABORA

SEQUENCE NUMBER: 7910200132

NATION: SOUTH AFRICA

SUBDIVISION: TRANSVAAL

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: S 24 DEG 03 MIN 00 SEC

LONGITUDE: E 31 DEG 08 MIN 00 SEC

UTM - ZONE: 36 HEMISPHERE: SOUTHERN

NORTHING: 7339130 EASTING: 310186

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 403 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING

BASE METAL CLAIMS

ALTERNATE NAMES

PHALABORA

PHALABORWA

OWNERSHIP

STATUS

PHOSPHATE DEVELOPMENT CORPORATION (FOSKOR)

OWNER-OPERATOR

COMMODITY

MODIFIER

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

COPPER

BYPRODUCT

IRON

BYPRODUCT

BADDELEYITE

BYPRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

RECORD 1

INDICATED 12,887,000,000

INFERRED 32,318,000,000

UNITS MT ORE

YEAR/DATA 1975

IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	6.5	WT-PCT

RESERVE-RESOURCE - REMARKS

RECORD 1: INDICATED RESERVES TO 600 METERS DEPTH; INFERRED TO 1500 METERS.

SOURCE FOR RECORD 1:

ROUX, E. H. THE SOUTH AFRICAN PHOSPHATE ROCK INDUSTRY. FERTILIZER SOCIETY OF SOUTH AFRICA JOURNAL, VOL. 2, 1975.

DEPOSIT\_HISTORICAL\_INFORMATION

## DISCOVERY METHOD:

ORE-MINERAL IN PLACE

## -----EXPLORATION METHODS-----

CORE DRILLING

YEAR OF DISCOVERY: 1906

YEAR OF INITIAL PRODUCTION: 1931

GEOLOGIC\_AND\_SPATIAL\_CHARACTERISTICS\_OF\_DEPOSIT

TYPE OF ORE BODY: STOCKWORK

MODE OF ORIGIN: MAGMATIC DIFFERENTIATION

SHAPE OF ORE BODY: PIPELIKE

CONTROLLING FEATURES: IGNEOUS

## MINERALIZED ZONE:

AVERAGE DEPTH: 10 METERS

MINIMUM DEPTH: 10 METERS

AVERAGE THICKNESS: 1000 METERS

## LITHOLCGY:

NAME OF FORMATION: PALABORA IGNEOUS COMPLEX GEOLOGIC AGE: PRECAMBRIAN

DEFORMATION DESCRIPTION: INTRUSION

RELATIONSHIP TO MINERALIZATION: MINERALIZATION DURING DEFORMATION

GEOLOGIC AGE: PRECAMBRIAN

## ROCK TYPE:

ALKALIC IGNEOUS IS ORE; GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
APATITE	PHOSPHATES
PHLOGOPITE	SILICATES
PYROXENE	SILICATES
CIOFSILE	SILICATES
FORNITE	SULFIDES

MINE/MILL\_INFORMATION

## PRESENT PRODUCTION

## SURFACE MINING:

METHOD: OPEN-PIT

UNITS: MT ORE/DAY

CAPACITY: 61600

HARDNESS OF ORE:

DESCRIPTION OF COVER:

MEDIUM HARD ROCKS

MEDIUM HARD ROCKS

AVERAGE COVER THICKNESS: 10 METERS

SURFACE AREA OF MINE: 2000 HECTARES

PERCENT WASTE ROCK: 33.3

## TRANSPORTATION (OHE):

ORIGINATING FACILITY: MINE

LOCATION: SOUTH AFRICA

LATITUDE: S 24 03 00

LONGITUDE: E 31 08 00

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: TRUCK

DESTINATION FACILITY: MILL (OFF-SITE)

LOCATION: SOUTH AFRICA

LATITUDE: S 24 00 00

LONGITUDE: E 31 08 00

## BENEFICIATION:

METHOD: FLOTATION  
 DESIGN CAPACITY: 52300  
 UNITS: MT ORE/DAY

-----DESCRIPTION OF MILLING-----  
 ORE/CRUSH/SCREEN/ GRIND/FLOAT/  
 DEWATER/DISPATCH

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE CONCENTRATE	P205	83	36.5	WT-PCT

TRANSPORTATION FOR PRODUCT: PHOSPHATE CONCENTRATE  
 ORIGINATING FACILITY: MILL (OFF-SITE) LOCATION: SOUTH AFRICA  
 LATITUDE: S 24 00 00 LONGITUDE: E 31 08 00  
 PERCENT SHIPPED: 100  
 METHOD OF TRANSPORTATION: RAIL  
 DESTINATION FACILITY: MARKET LOCATION: SOUTH AFRICA

BIBLIOGRAPHY RECORDS

DIXON. ATLAS OF WORLD MINING - SOUTH AFRICA. 1979.

ENGINEERING AND MINING JOURNAL. NEL, VIC, PALABORA'S NEW HEAVY MINERALS PLANTS ADDS URANIUM CONCENTRATE TO THE RECOVERY LIST. NOV. 1972.

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PHOSPHATE DEVELOPMENT CORPORATION, COETZEE, C. B. AND VISSER, H. N. AND MEHLISS, A. T. M., PHOSPHATES: MINERAL RESOURCES OF THE REPUBLIC OF SOUTH AFRICA, 5TH EDITION, HANDBOOK 7, 1976, 8 P.

PHOSPHATE DEVELOPMENT CORP., LTD. ANNUAL REPORT. 1980.

ROUX, E. H. THE SOUTH AFRICAN PHOSPHATE ROCK INDUSTRY. FERTILIZER SOCIETY OF SOUTH AFRICA JOURNAL, VOL. 2, 1975.

RUSSELL, B. G. THE POSSIBLE RECOVERY, DURING THE MANUFACTURE OF PHOSPHORIC ACID, OF RARE EARTHS FROM FOSKOR CONCENTRATE. BULLETIN NO. 1, MINERALS BUREAU, JOHANNESBURG, SOUTH AFRICA, 1977.

SYRIALOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SHARKYA (A&amp;B)

SEQUENCE NUMBER: 5020000002

NATION: SYRIA

SUBDIVISION: NOT SUBDIVIDED

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 34 DEG 43 MIN 00 SEC

LONGITUDE: E 36 DEG 42 MIN 00 SEC

UTM - ZONE: 37 HEMISPHERE: NORTHERN

NORTHING: 3843834 EASTING: 289375

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

EASTERN A &amp; B

AL-SHARGIA A &amp; B

## OWNERSHIP

## STATUS

GOVERNMENT (GOVERNMENT OWNED)

OWNER-OPERATOR

## COMMODITY

## MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

RECORD 1

UNDIFFERENTIATED

405,000,000

UNITS

MT ORE

YEAR/DATA

1980

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	24	WT-PCT

## RESERVE-RESOURCE - REMARKS

## SOURCE FOR RECORD 1:

BRITISH SULPHUR. WORLD SURVEY OF PHOSPHATE DEPOSITS. 1980.

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1933

YEAR OF INITIAL PRODUCTION: 1974

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

## -----EXPLORATION METHODS-----

MODE OF ORIGIN: SEDIMENTATION

CORE DRILLING/TEST PITS/

SHAPE OF ORE BODY: TABULAR

TRENCHING

## MINERALIZED ZONE:

AVERAGE LENGTH: 4000 METERS

AVERAGE WIDTH: 3500 METERS

AVERAGE THICKNESS: 12 METERS

**LITHOLOGY:**

NAME OF FORMATION: CAMPANIAN SERIES      GEOLOGIC AGE: UPPER CRETACEOUS  
 DEFORMATION DESCRIPTION: MINOR FOLDING  
 ROCK TYPE:  
 PHOSPHORITE      IS ORE  
 LIMESTONE      LIES OVER ORE; LIES UNDER ORE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS
COLLOPHANE	PHOSPHATES
CALCITE	CARBONATES
QUARTZ	FORMS OF SiO <sub>2</sub>

**MINE/MILL INFORMATION****SURFACE MINING:**

METHOD: STRIPPING

**TRANSPORTATION (ORE):**

ORIGINATING FACILITY: MINE	LOCATION: SYRIA
LATITUDE: N 34 43 00	LONGITUDE: E 36 42 00
PERCENT SHIPPED: 100	
DESTINATION FACILITY: MILL (ON-SITE)	LOCATION: SYRIA
LATITUDE: N 34 43 00	LONGITUDE: E 36 42 00

**BENEFICIATION:**

METHOD: CLASSIFIER

----- DESCRIPTION OF MILLING -----  
 ORE/CRUSH/DRY/SCREEN/CLASSIFY STOCKPILE

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	69	30	WT-PCT

**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY: MILL (ON-SITE)	LOCATION: SYRIA
LATITUDE: N 34 43 00	LONGITUDE: E 36 42 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: RAIL	DISTANCE (KM): 250
DESTINATION FACILITY: PORT	LOCATION: TARTOUS, SYRIA

**BIBLIOGRAPHY RECORDS**

U S BUREAU OF MINES. MINERAL TRADE NOTES. VOL 75, NO 2, FEBRUARY 1978,  
 P. 14.

BRITISH SULPHUR. WORLD SURVEY OF PHOSPHATE DEPOSITS. 1980.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: TARAG EL HSARI

SEQUENCE NUMBER: 5020000003

NATION: SYRIA

SUBDIVISION: NOT SUBDIVIDED

TYPE OF OPERATION: UNKNOWN

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 34 DEG 10 MIN 00 SEC

LONGITUDE: E 38 DEG 50 MIN 00 SEC

UTM - ZONE: 37 HEMISPHERE: NORTHERN

NORTHING: 3780453 EASTING: 484638

POINT OF REFERENCE: GRS 80 BODY

PRECISION: 5 KILOMETERS

YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

SIJRI HAESARI

AL HAEERI

AL MAEERI

## OWNERSHIP

GENERAL COMPANY OF PHOSPHATE MINES-GECOPHARM (GOVERNMENT) OWNER-OPERATOR

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2
UNDIFFERENTIATED UNITS	400,000,000	450,000,000
YEAR/DATA	MT ORE 1980	MT ORE 1979

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	19	WT-PCT
2	P205	19	WT-PCT

## RESERVE-RESOURCE - REMARKS

## SOURCE FOR RECORD 1:

BRITISH SULPHUR. WORLD SURVEY OF PHOSPHATE DEPOSITS, 1980.

UNITED STATES BUREAU OF MINES. MINERAL TRADE NOTES. VOL. 57,  
NO. 3, SEPTEMBER 1963.

## SOURCE FOR RECORD 2:

EARTH SCIENCES, INC. URANIFEROUS PHOSPHATES RESOURCES AND  
TECHNOLOGY AND ECONOMICS OF URANIUM RECOVERY FROM PHOSPHATES  
RESOURCES, UNITED STATES AND FREE WORLD. VOL. 1, 1979.

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
MODE OF ORIGIN: SEDIMENTATION

MINERALIZED ZONE:  
AVERAGE THICKNESS: 0.4 METER

LITHOLOGY:  
GEOLOGIC AGE: EOCENE

MINERALIZATION:  
MINERAL NAME MINERAL CLASS  
COLLOPHANE PHOSPHATES

BIBLIOGRAPHY RECORDS

BRITISH SULPHUR. WORLD SURVEY OF PHOSPHATE DEPOSITS. 1980.

EARTH SCIENCES, INC. URANIFEROUS PHOSPHATES RESOURCES AND TECHNOLOGY AND ECONOMICS OF URANIUM RECOVERY FROM PHOSPHATES RESOURCES, UNITED STATES AND FREE WORLD. VOL. 1, 1979.

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WORLD BANK. WORLD PHOSPHATE SURVEY BACKGROUND PAPERS. SEPTEMBER 1979.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: KNEIFESS

SEQUENCE NUMBER: 5020000004

NATION: SYRIA

SUBDIVISION: NOT SUBDIVIDED

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 34 DEG 05 MIN 00 SEC

LONGITUDE: E 38 DEG 05 MIN 00 SEC

UTM - ZONE: 37 HEMISPHERE: NORTHERN

NORTHING: 3771580 EASTING: 415427

POINT OF REFERENCE: GRS 80 EGY

PRECISION: 5 KILOMETERS

YEAR OF INFORMATION: 1981

ALTERNATE NAMES

KHNEIFISS

OWNERSHIP

STATUS

OWNER-OPERATOR

GENERAL CO. OF PHOSPHATE &amp; MINES-GECOPHAM (GOVERNMENT)

COMMODITY

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

MEASURED	RECORD 1	RECORD 2	RECORD 3
UNDIFFERENTIATED	16,000,000	-----	-----
UNITS	-----	17,000,000	15,000,000
YEAR/DATA	MT ORE 1979	MT ORE 1979	MT ORE 1963

IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	28	WT-PCT
2	P205	28.5	WT-PCT
3	P205	28.5	WT-PCT

SOURCE FOR RECORD 1:

WORLD BANK. WORLD PHOSPHATE SURVEY BACKGROUND PAPERS. SEPTEMBER 1979.

SOURCE FOR RECORD 2:

EARTH SCIENCES, INC. URANIFEROUS PHOSPHATES RESOURCES AND TECHNOLOGY AND ECONOMICS OF URANIUM RECOVERY FROM PHOSPHATE RESOURCES, UNITED STATES AND FREE WORLD. VOL. 1, 1979.

SOURCE FOR RECORD 3:

UNITED STATES BUREAU OF MINES. MINERAL TRADE NOTES. VOL. 57, NO. 3, SEPTEMBER 1963.

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1933

-----EXPLORATION METHODS-----  
COPE DRILLING/TRENCHING

YEAR OF INITIAL PRODUCTION: 1971

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

SHAPE OF ORE BODY: MASSIVE

MINERALIZED ZONE:

AVERAGE THICKNESS: 3.5 METERS

LITHOLOGY:

GEOLOGIC AGE: EOCENE

MINERALIZATION:

MINERAL NAME	MINERAL CLASS
COLLOPHANE	PHOSPHATES
CALCITE	CARBONATES
CHALCEDONY	FORMS OF SiO <sub>2</sub>
QUARTZ	FORMS OF SiO <sub>2</sub>

MINE/MILL INFORMATION

SURFACE MINING:

METHOD: OPEN-PIT

CAPACITY: 3400

UNITS: MT ORE/DAY

DESCRIPTION OF COVER:

MEDIUM-HARD ROCKS

TRANSPORTATION (ORE):

CRUCINATING FACILITY: MINE

LOCATION: SYRIA

LATITUDE: N 34 05 00

LONGITUDE: E 38 05 00

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: TRUCK

DISTANCE (KM): 1

DESTINATION FACILITY: MILL (ON-SITE)

LOCATION: SYRIA

LATITUDE: N 34 05 00

LONGITUDE: E 38 05 00

BENEFICIATION:

METHOD: SIZING

----- DESCRIPTION OF MILLING -----  
ORE/GRIND/SIZE/DRY

DESIGN CAPACITY: 3400

UNITS: MT ORE/DAY

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	69	32	WT-PCT

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: SYRIA

LATITUDE: N 34 05 00

LONGITUDE: E 38 05 00

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: RAIL

DISTANCE (KM): 300

DESTINATION FACILITY: PORT

LOCATION: TARTOUS, SYRIA

BIBLIOGRAPHY RECORDS

BRITISH SULPHUR. WORLD SURVEY OF PHOSPHATE DEPOSITS. 1980.

ECONOMIC GEOLOGY. PHOSPHATIC DEPOSITS IN SYRIA AND SAFAGA DISTRICT EGYPT. VOL. 61, 1966, PP. 1142-1161.

EARTH SCIENCES, INC. URANIFEROUS PHOSPHATES RESOURCES AND TECHNOLOGY AND ECONOMICS OF URANIUM RECOVERY FROM PHOSPHATE RESOURCES, UNITED STATES AND FREE WORLD. VOL. 1, 1979.

UNITED STATES BUREAU OF MINES. MINERAL TRADE NOTES. VOL. 57, NO. 3, SEPTEMBER 1963.

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UNITED STATES BUREAU OF MINES. MINERAL TRADE NOTES, VOL. 75, NO. 2, FEBRUARY 1978.

WORLD BANK. WORLD PHOSPHATE SURVEY BACKGROUND PAPERS. SEPTEMBER 1979.

TOGOLOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: DAGBATI

SEQUENCE NUMBER: 7520000001

NATION: TOGO

SUBDIVISION: NOT SUBDIVIDED

TYPE OF OPERATION: SURFACE

CURRENT STATUS: EXPLORERED DEPOSIT

LATITUDE: N 06 DEG 05 MIN 00 SEC

LONGITUDE: E 01 DEG 30 MIN 00 SEC

UTM - ZONE: 31 HEMISPHERE: NORTHERN

NORTHING: 672604 EASTING: 334000

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 30 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

OWNERSHIP

STATUS

CIE. TOGOLAISE DES MINES DE BENIN - GOVT. (COTOMIB) OWNER-OPERATOR

COMMODITY

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1952

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

MINERALIZED ZONE:

AVERAGE DEPTH: 15 METERS  
STRIKE/DIP: N45E/05SMINIMUM DEPTH: 7 METERS  
AVERAGE THICKNESS: 4 METERS

LITHOLOGY:

NAME OF FORMATION: YPRESIAN

GEOLOGIC AGE: EOCENE

ROCK TYPE:

PHOSPHORITE IS ORE  
CLAY GANGUE

MINERALIZATION:

MINERAL NAME MINERAL CLASS  
APATITE PHOSPHATES  
COLLOPHANE PHOSPHATES

BIBLIOGRAPHY RECORDS

BRITISH SULPHUR CORP. WORLD SURVEY OF PHOSPHATE DEPOSITS. 1980, PP. 121-124.

DEVITO, R. H. AND D. N. STEVENS (EDITORS). URANIFEROUS PHOSPHATE RESOURCES AND TECHNOLOGY AND ECONOMICS OF URANIUM RECOVERY FROM PHOSPHATE RESOURCES, UNITED STATES AND FREE WORLD. VOL. 1, 1979, PP. 431, 432.

ENGINEERING AND MINING JOURNAL. SHOVEL PRETESTS STRIPPING OF TOGO PHOSPHATE. JUNE 1976, PP. 287, 290.

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PHOSPHORUS AND POTASSIUM. TOGO. NO. 100, 1979.

WORLD MINING CATALOG. TOGO. SURVEY AND DIRECTORY. NO. 1980.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: HAHATOE/KPOGAME SEQUENCE NUMBER: 7520200001

NATION: TOGO SUBDIVISION: REGION MARITIME  
 TYPE OF OPERATION: SURFACE CURRENT STATUS: PRODUCER  
 LATITUDE: N 06 DEG 22 MIN 00 SEC LONGITUDE: E 01 DEG 23 MIN 00 SEC  
 UTM - ZONE: 31 HEMISPHERE: NORTHERN NORTHING: 703972 EASTING: 321182  
 POINT OF REFERENCE: ORE BODY PRECISION: 1 KILOMETER  
 ELEVATION: 5 METERS PRECISION: 10 METERS  
 DATUM: SEA LEVEL YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

AKOUMAPE  
 AKOUMAPE (LOME)  
 BENIN MINES

## OWNERSHIP

CIE.COGOLAISE DES MINES DE BENIN (COTOMIB) - TOGO GOVT.

STATUS OWNER-OPERATOR

COMMODITY PHOSPHATE

MARKETABILITY PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2
INDICATED	130,000,000	-----
UNDIFFERENTIATED	-----	100,000,000
UNITS	MT ORE	MT ORE
YEAR/DATA	1976	1981

## RESERVE-RESOURCE - REMARKS

## SOURCE FOR RECORDED 1:

ENGINEERING AND MINING JOURNAL. SHOVEL PRETEST STRIPPING OF TOGO PHOSPHATE. JUNE 1976, PP. 287, 290.

## SOURCE FOR RECORD 2:

WORLD MINING. MAJOR PHOSPHATE PLANS RUINED BY POOR ECONOMY. OCTOBER 1981, P. 80.

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1952

-----EXPLORATION METHODS-----

YEAR OF INITIAL PRODUCTION: 1961

TEST SHAFTS/DRILLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION; RESIDUAL CONCENTRATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDING

## MINERALIZED ZONE:

AVERAGE DEPTH: 15 METERS  
 AVERAGE THICKNESS: 4 METERS

STRIKE/DIP: N45E/04S

## UNCONSOLIDATED MATERIAL:

AVERAGE THICKNESS: 15 METERS

## LITHOLOGY:

NAME OF FORMATION: YPRESIAN      GEOLOGIC AGE: EOCENE  
 ROCK TYPE:  
 PHOSPHORITE      IS ORE; GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
COLLOPHANE	PHOSPHATES

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: STRIPPING	UNITS: MT ORE/DAY
CAPACITY: 15900	HARDNESS OF ORE:
DESCRIPTION OF COVER: SAND, SILT	SAND, SILT
AVERAGE COVER THICKNESS: 15 METERS	

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE	LOCATION: HAHOTOE/KPOGAME PITS
LATITUDE: N 06 22 00	LONGITUDE: E 01 23 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: RAIL	DISTANCE (KM): 25
DESTINATION FACILITY: MILL (OFF-SITE)	LOCATION: KPEME

## BENEFICIATION:

METHOD: WASHING	----- DESCRIPTION OF MILLING -----
DESIGN CAPACITY: 15900	ORE/DRUM SCRUBBERS/WET SCREENING/CYCLONING/
UNITS: MT ORE/DAY	DRYING/SCREENING

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	69	36	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (OFF-SITE)	LOCATION: KPEME
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: OCEAN	
DESTINATION FACILITY: MARKET	

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WORLD MINING CATALOG. SURVEY AND DIRECTORY, TOGO. NO. 1980.

## TUNISIA

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: KALAA KHASBA

SEQUENCE NUMBER: 7230150002

NATION: TUNISIA

SUBDIVISION: EL KEF

TYPE OF OPERATION: UNDERGROUND

CURRENT STATUS: PRODUCER

LATITUDE: N 35 DEG 40 MIN 00 SEC

LONGITUDE: E 08 DEG 40 MIN 00 SEC

UTM - ZONE: 32 HEMISPHERE: NORTHERN

NORTHING: 3946829 EASTING: 469830

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

KALAA DJERDA

## OWNERSHIP

CIE DES PHOSPHATES DE GAFSA(GOVT.)

## STATUS

OWNER-OPERATOR

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

YEAR OF INITIAL PRODUCTION: 1893

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDING

## MINERALIZED ZONE:

MINIMUM DEPTH: 150 METERS

AVERAGE THICKNESS: 4 METERS

## LITHOLOGY:

GEOLOGIC AGE: EOCENE

DEFORMATION DESCRIPTION: MINOR FOLDING; FAULTING

RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

ROCK TYPE:

PHOSPHORITE IS ORE

## MINERALIZATION:

MINERAL NAME

MINERAL CLASS

FLUORAPATITE

PHOSPHATES

MINE/MILL INFORMATION

## UNDERGROUND MINING:

METHOD: ROOM AND PILLAR

CHARACTERISTIC OF ROCK: NO PLANES OF WEAKNESS

ROCK AND WATER CONDITIONS: HARDROCK WITH LITTLE WATER

ROCK/MINE SUPPORT: TIMBER

CONDITION OF WORKINGS: OPEN

SHAFTS - NUMBER: 2

AVERAGE DEPTH: 150 METERS

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE

LOCATION: TUNISIA

LATITUDE: N 35 40 00

LONGITUDE: E 08 40 00

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: TRUCK

DESTINATION FACILITY: MILL (ON-SITE)

LOCATION: TUNISIA

LATITUDE: N 35 40 00

LONGITUDE: E 08 40 00

## BENEFICIATION:

METHOD: WASHING

-----DESCRIPTION OF MILLING-----  
ORE/WASH/CRUSH/SCREEN/SIZE

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	80	30.23	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: TUNISIA

LATITUDE: N 35 40 00

LONGITUDE: E 08 40 00

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: RAIL

DISTANCE (KM): 400

DESTINATION FACILITY: PORT

LOCATION: LA GOULETTE, TUNISIA

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SRI INTERNATIONAL. PHOSPHATE ROCK. CHEMICAL ECONOMICS HANDBOOK, MARCH 1980.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: METLAOUI

SEQUENCE NUMBER: 7230300001

NATION: TUNISIA

SUBDIVISION: GAFSA

TYPE OF OPERATION: UNDERGROUND

CURRENT STATUS: PRODUCER

LATITUDE: N 34 DEG 19 MIN 00 SEC

LONGITUDE: E 08 DEG 25 MIN 00 SEC

UTM - ZONE: 32 HEMISPHERE: NORTHERN

NORTHING: 3797226 EASTING: 446329

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 535 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

OWNERSHIP

STATUS

CIE DES PHOSPHATES DE GAFSA (GOVT.)

OWNER-OPERATOR

COMMODITY

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

RECORD 1

MEASURED	9,500,000
INDICATED	4,200,000
INFERRED	40,900,000
UNITS	MT ORE
YEAR/DATA	1981

RESERVE-RESOURCE - REMARKS

SOURCE FOR RECORD 1:

ENGINEERING AND MINING JOURNAL. 1981 E/MJ INTERNATIONAL DIRECTORY OF MINING. 1981, P. 370.

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1890

-----EXPLORATION METHODS-----  
CORE DRILLING

YEAR OF INITIAL PRODUCTION: 1890

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDING

MINERALIZED ZONE:

AVERAGE DEPTH: 200 METERS

MINIMUM DEPTH: 0 METERS

AVERAGE THICKNESS: 4.5 METERS

STRIKE: N90E

LITHOLOGY:

NAME OF FORMATION: METLAOUI FORMATION GEOLOGIC AGE: EOCENE

DEFORMATION DESCRIPTION: MINOR FOLDING

RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
FLUORAPATITE	PHOSPHATES

MINE/MILL INFORMATION

## UNDERGROUND MINING:

METHOD: ROOM AND PILLAR	UNITS: MT ORE/DAY
CAPACITY: 2100	
CONDITION OF WORKINGS: OPEN	
SHAFTS - NUMBER: 5	AVERAGE DEPTH: 100 METERS

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE	LOCATION: TUNISIA
LATITUDE: N 34 19 00	LONGITUDE: E 08 25 00
METHOD OF TRANSPORTATION: CONVEYOR	DISTANCE (KM): 5
DESTINATION FACILITY: MILL (ON-SITE)	LOCATION: TUNISIA
LATITUDE: N 34 19 00	LONGITUDE: E 08 25 00

## BENEFICIATION:

METHOD: WASHING	-----DESCRIPTION OF MILLING-----
DESIGN CAPACITY: 2100	ORE/SCREEN/CRUSH/SCRUB/SCREEN/DESLIME/
UNITS: MT ORE/DAY	FILTER/DRY STOCKPILE

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	73	30.23	WT-PCT

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INTERNATIONAL GEOLOGICAL CONGRESS. LES RESERVES MONDIALES EN PHOSPHATES. 14TH, 2 VOLUMES, 1926.

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SRI INTERNATIONAL. PHOSPHATE ROCK. CHEMICAL ECONOMICS HANDBOOK, MARCH 1980.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: KEF ESCHFAIR

SEQUENCE NUMBER: 7230300002

NATION: TUNISIA

SUBDIVISION: GAFSA

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 34 DEG 23 MIN 00 SEC

LONGITUDE: E 08 DEG 28 MIN 00 SEC

UTM - ZONE: 32 HEMISPHERE: NORTHERN

NORTHING: 3804593 EASTING: 450968

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 550 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

KEF ES SCHFAIR

KEF ESH SCHFAIR

KEF ECHFAIER

## OWNERSHIP

COMPAGNIE DES PHOSPHATES DE GAFSA (GOVT)

## STATUS

OWNER-OPERATOR

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2
MEASURED	38,000,000	53,900,000
INDICATED	88,000,000	34,800,000
INFERRED	126,000,000	30,600,000
UNITS	MT ORE	MT ORE
YEAR/DATA	1980	1981

## RECORD 2

53,900,000

34,800,000

30,600,000

MT ORE

1981

## RESERVE-RESOURCE - REMARKS

## SOURCE FOR RECORD 1:

BRITISH SULPHUR CORP. LTD. WORLD SURVEY OF PHOSPHATE DEPOSITS. FOURTH EDITION, 1980.

## SOURCE FOR RECORD 2:

ENGINEERING AND MINING JOURNAL. 1981 E/MJ INTERNATIONAL DIRECTORY OF MINING. 1981, P. 370.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

## -----EXPLORATION METHODS-----

ORE-MINERAL IN PLACE

CORE DRILLING/TRENCHING

YEAR OF DISCOVERY: 1899

YEAR OF INITIAL PRODUCTION: 1972

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
MODE OF ORIGIN: SEDIMENTATION  
SHAPE OF ORE BODY: TABULAR  
CONTROLLING FEATURES: BEDDING

MINERALIZED ZONE:  
AVERAGE DEPTH: 25 METERS                            MINIMUM DEPTH: 10 METERS  
AVERAGE THICKNESS: 10 METERS                            STRIKE/DIP: N90E/20N

LITHOLOGY:  
NAME OF FORMATION: METLAOUI FORMATION GEOLOGIC AGE: EOCENE  
DEFORMATION DESCRIPTION: MINOR FOLDING  
RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION  
ROCK TYPE:  
PHOSPHORITE    IS ORE  
LIMESTONE    LIES OVER ORE; LIES UNDER ORE

MINERALIZATION:  
MINERAL NAME    MINERAL CLASS  
FLUORAPITITE    PHOSPHATES

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: OPEN-PIT

CAPACITY: 7300

PERCENT WASTE ROCK: 16.7

UNITS: MT ORE/DAY

AVERAGE COVER THICKNESS: 2 METERS

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE

LATITUDE: N 34 23 00

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: TRUCK

DESTINATION FACILITY: MILL (ON-SITE)

LATITUDE: N 34 23 00

LOCATION: TUNISIA

LONGITUDE: E 08 28 00

DISTANCE (KM): 1

LOCATION: TUNISIA

LONGITUDE: E 08 28 00

## BENEFICIATION:

METHOD: WASHING

DESIGN CAPACITY: 7300

UNITS: MT ORE/DAY

----- DESCRIPTION OF MILLING -----  
 ORE/CRUSH/STOCKPILE/DRUM-SCRUBBED/  
 SCREENED/CYCLONE DESLIMED/SCREENED/  
 FILTERED/DRIED

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	72	30.2	WT-PCT

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SRI INTERNATIONAL. PHOSPHATE ROCK, CHEMICAL ECONOMICS HANDBOOK. MARCH 1980.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: M'DILLA

SEQUENCE NUMBER: 7230300003

NATION: TUNISIA

SUBDIVISION: GAFSA

TYPE OF OPERATION: UNDERGROUND

CURRENT STATUS: PRODUCER

LATITUDE: N 34 DEG 18 MIN 00 SEC

LONGITUDE: E 08 DEG 46 MIN 00 SEC

UTM - ZONE: 32 HEMISPHERE: NORTHERN

NORTHING: 3795249 EASTING: 478527

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 300 METERS

PRECISION: 10 METERS

YEAR OF INFORMATION: 1981

OWNERSHIP

STATUS

COMPAGNIE DES PHOSPHATES DE GAFSA (GOVT)

OWNER-OPERATOR

COMMODITY

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

RECORD 1

MEASURED

79,880,000

UNITS

MT ORE

YEAR/DATA

1981

SOURCE FOR RECORD 1:

ENGINEERING AND MINING JOURNAL. 1981 E/MJ INTERNATIONAL DIRECTORY OF MINING. 1981, P. 370.

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1890

-----EXPLORATION METHODS-----  
CORE DRILLINGGEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDING

MINERALIZED ZONE:

AVERAGE DEPTH: 200 METERS

MINIMUM DEPTH: 0 METERS

AVERAGE THICKNESS: 3 METERS

STRIKE/DIP: N90E/11N

LITHOLOGY:

NAME OF FORMATION: METLAOUI FORMATION GEOLOGIC AGE: EOCENE

RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

MINERALIZATION:

MINERAL NAME

MINERAL CLASS

APATITE

PHOSPHATES

MINE/MILL INFORMATION

## UNDERGROUND MINING:

METHOD: ROOM AND PILLAR  
CAPACITY: 5400

UNITS: MT ORE/DAY

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE  
LATITUDE: N 34 18 00  
PERCENT SHIPPED: 100  
METHOD OF TRANSPORTATION: CONVEYOR  
DESTINATION FACILITY: MILL (ON-SITE)  
LATITUDE: N 34 18 00

LOCATION: TUNISIA  
LONGITUDE: E 08 46 00  
DISTANCE (KM): 5  
LOCATION: TUNISIA  
LONGITUDE: E 08 46 00

## BENEFICIATION:

METHOD: WASHING  
DESIGN CAPACITY: 5400  
UNITS: MT ORE/DAY

-----DESCRIPTION OF MILLING-----  
ORE/CRUSH/SCRUB/SCREEN/SIZE/DESLIME/  
FILTER/DRY STOCKPILE

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	74	30.23	WT-PCT

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AMERICAN EMBASSY TUNISIA. INDUSTRIAL OUTLOOK REPORT. JUNE 9, 1980.

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SRI INTERNATIONAL, PHOSPHATE ROCK. CHEMICAL ECONOMICS HANDBOOK, MARCH 1980.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: REDEYEF

SEQUENCE NUMBER: 7230300004

NATION: TUNISIA  
 TYPE OF OPERATION: UNDERGROUND  
 LATITUDE: N 34 DEG 22 MIN 00 SEC  
 UTM - ZONE: 32 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 700 METERS  
 DATUM: SEA LEVEL

SUBDIVISION: GAFSA  
 CURRENT STATUS: PRODUCER  
 LONGITUDE: E 08 DEG 25 MIN 00 SEC  
 NORTHING: 3802770 EASTING: 446361  
 PRECISION: 1 KILOMETER  
 PRECISION: 100 METERS  
 YEAR OF INFORMATION: 1981

OWNERSHIP  
 CIE DES PHOSPHATES DE GAFSA (GOVT.)

STATUS  
 OWNER-OPERATOR

COMMODITY  
 PHOSPHATE

MARKETABILITY  
 PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1
MEASURED	62,300,000
INDICATED	137,700,000
UNITS	MT ORE
YEAR/DATA	1981

## RESERVE-RESOURCE REMARKS

## SOURCE FOR RECORD 1:

ENGINEERING AND MINING JOURNAL. 1981 E/MJ INTERNATIONAL DIRECTORY OF MINING. 1981, P. 370.

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1899

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
 MODE OF ORIGIN: SEDIMENTATION  
 SHAPE OF ORE BODY: TABULAR  
 CONTROLLING FEATURES: BEDDING

## MINERALIZED ZONE:

AVERAGE DEPTH:	100 METERS	MINIMUM DEPTH:	0 METERS
AVERAGE THICKNESS:	1.8 METERS	STRIKE/DIP:	N90E/20S

## LITHOLOGY:

NAME OF FORMATION:	METLAOUI FORMATION	GEOLOGIC AGE:	EOCENE
DEFORIFICATION DESCRIPTION:	MINOR FOLDING		
RELATIONSHIP TO MINERALIZATION:	MINERALIZATION PRECEDING DEFORMATION		
ROCK TYPE:			
PHOSPHORITE	IS ORE		
LIMESTONE	LIES OVER ORE; LIES UNDER ORE		

## MINERALIZATION:

MINERAL NAME  
FLUORAPATITE

MINERAL CLASS  
PHOSPHATES

MINE/MILL INFORMATION

## UNDERGROUND MINING:

METHOD: ROOM AND PILLAR  
CAPACITY: 3800

UNITS: MT ORE/DAY

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE

LOCATION: TUNISIA

LATITUDE: N 34 22 00

LONGITUDE: E 08 25 00

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: CONVEYOR

DESTINATION FACILITY: MILL (ON-SITE)

LOCATION: TUNISIA

LATITUDE: N 34 22 00

LONGITUDE: E 08 25 00

## BENEFICIATION:

METHOD: CLASSIFIER

-----DESCRIPTION OF MILLING-----

DESIGN CAPACITY: 3800

UNITS: MT ORE/DAY

ORE/CRUSH/DRY/SCREEN/AIR CLASSIFY/  
STOCKPILE

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	67	30.23	WT-PCT

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SRI INTERNATIONAL. PHOSPHATE ROCK. CHEMICAL ECONOMICS HANDBOOK, MARCH 1980.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: MOULARES/M'RATA SEQUENCE NUMBER: 7230300005

NATION: TUNISIA SUBDIVISION: GAFSA  
 TYPE OF OPERATION: UNDERGROUND CURRENT STATUS: PRODUCER  
 LATITUDE: N 34 DEG 29 MIN 00 SEC LONGITUDE: E 08 DEG 16 MIN 00 SEC  
 UTM - ZONE: 32 HEMISPHERE: NORTHERN NORTHING: 3815797 EASTING: 432662  
 POINT OF REFERENCE: ORE BODY PRECISION: 1 KILOMETER  
 ELEVATION: 300 METERS PRECISION: 10 METERS  
 DATUM: SEA LEVEL YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
STATE LANDSOWNERSHIP  
CIE DES PHOSPHATES DE GAFSA (GOVT.)COMMODITY MARKETABILITY  
PHOSPHATE PRIMARY PRODUCTPUBLISHED RESERVE-RESOURCE INFORMATION

	RECORD 1	RECORD 2
MEASURED	15,300,000	47,000,000
INDICATED	4,200,000	-----
INFERRRED	4,500,000	-----
UNITS	MT ORE	MT ORE
YEAR/DATA	1981	1981

## RESERVE-RESOURCE - REMARKS

RECORD 1: PERTAINS TO MOULARES MINE  
 RECORD 2: PERTAINS TO M'RATA MINE

## SOURCE FOR RECORDS 1 AND 2:

ENGINEERING AND MINING JOURNAL. 1981 E/MJ INTERNATIONAL  
 DIRECTORY OF MINING. 1981, P. 370.

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1895

YEAR OF INITIAL PRODUCTION: 1905

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
 MODE OF ORIGIN: SEDIMENTATION  
 SHAPE OF ORE BODY: TABULAR  
 CONTROLLING FEATURES: BEDDING

## MINERALIZED ZONE:

AVERAGE DEPTH: 100 METERS  
 AVERAGE THICKNESS: 4 METERS

MINIMUM DEPTH: 0 METERS  
 STRIKE/DIP: N90E/10N

## LITHOLOGY:

NAME OF FORMATION: METLAOUI FORMATION      GEOLOGIC AGE: EOCENE  
 DEFORMATION DESCRIPTION: MINOR FOLDING  
 RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION  
 ROCK TYPE:

PHOSPHORITE	IS ORE
LIMESTONE	LIES OVER ORE; LIES UNDER ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
FLUORAFATITE	PHOSPHATES

MINE/MILL INFORMATION

## UNDERGROUND MINING:

METHOD: ROOM AND FILLAR  
 CAPACITY: 6100 UNITS: MT ORE/DAY  
 ROCK AND WATER CONDITIONS: SOFT NONPLASTIC WITH LITTLE WATER  
 ROCK/MINE SUPPORT: UNSUPPORTING MAY SLOUGH; POST, HEADBOARD, CAPS,  
 ROOF BOLTS

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE	LOCATION: TUNISIA
LATITUDE: N 34 29 00	LONGITUDE: E 08 16 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: TRUCK	DISTANCE (KM): 2
DESTINATION FACILITY: MILL (ON-SITE)	LOCATION: TUNISIA
LATITUDE: N 34 29 00	LONGITUDE: E 08 16 00

## BENEFICIATION:

METHOD: WASHING	-----DESCRIPTION OF MILLING-----
DESIGN CAPACITY: 6100	ORE/DRY/CRUSH/SCREEN/AIR CLASSIFY/
UNITS: MT ORE/DAY	STOCKPILE -OR- ORE/SCREEN/CRUSH/
	SCRUB/DESLIME/FILTER/DRY/STOCKPILE

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	73	30.23	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE)	LOCATION: TUNISIA
LATITUDE: N 34 29 00	LONGITUDE: E 08 16 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: RAIL	
DESTINATION FACILITY: CHEMICAL PLANT	LOCATION: GABES, TUNISIA

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SEHIS

SEQUENCE NUMBER: 7230300007

NATION: TUNISIA

SUBDIVISION: GAFSA

TYPE OF OPERATION: UNDERGROUND

CURRENT STATUS: PRODUCER

LATITUDE: N 34 DEG 15 MIN 00 SEC

LONGITUDE: E 08 DEG 12 MIN 00 SEC

UTM - ZONE: 32 HEMISPHERE: NORTHERN

NORTHING: 3789970 EASTING: 426336

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 300 METERS

PRECISION: 10 METERS

CATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

SECTOR 100

DJELLABIA

## OWNERSHIP

CIE DES PHOSPHATES DE GAFSA (GOVT.)

## STATUS

OWNER-OPERATOR

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

UNDIFFERENTIATED	RECORD 1
UNITS	65,200,000
YEAR/DATA	MT ORE
	1981

## RESERVE-RESOURCE - REMARKS

## SOURCE FOR RECORD 1:

ENGINEERING AND MINING JOURNAL. 1981 E/MJ INTERNATIONAL DIRECTORY OF MINING. 1981, P. 370.

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1899

## -----EXPLORATION METHODS-----

YEAR OF INITIAL PRODUCTION: 1971

CORE DRILLING/TRENCHING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDING

## MINERALIZED ZONE:

AVERAGE DEPTH: 200 METERS

MINIMUM DEPTH: 0 METERS

AVERAGE THICKNESS: 2 METERS

STRIKE/DIP: N90E/10N

## LITHOLOGY:

NAME OF FORMATION: METLAOUI FORMATION GEOLOGIC AGE: EOCENE  
 DEFORMATION DESCRIPTION: MINOR FOLDING  
 RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION  
 ROCK TYPE:  
 PHOSPHORITE IS ORE  
 LIMESTONE LIES OVER ORE; LIES UNDER ORE

## MINERALIZATION:

MINERAL NAME MINERAL CLASS  
 FLUORAPATITE PHOSPHATES

MINE/MILL INFORMATION

## UNDERGROUND MINING:

METHOD: LONGWALL CAVING  
 CAPACITY: 4100 UNITS: MT ORE/DAY  
 ROCK AND WATER CONDITIONS: SOFT NONPLASTIC WITH LITTLE WATER  
 ROCK/MINE SUPPORT: TIMBER  
 CONDITION OF WORKINGS: OPEN  
 TOTAL LENGTH OF WORKINGS: 4840 METERS  
 INCLINES - NUMBER: 6 SLOPE: 10 DEGREES  
 SHAFTS - NUMBER: 2 AVERAGE DEPTH: 200 METERS

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE LOCATION: TUNISIA  
 LATITUDE: N 34 15 00 LONGITUDE: E 08 12 00  
 PERCENT SHIPPED: 100  
 METHOD OF TRANSPORTATION: CONVEYOR DISTANCE (KM): 5  
 DESTINATION FACILITY: MILL (ON-SITE) LOCATION: TUNISIA  
 LATITUDE: N 34 15 00 LONGITUDE: E 08 12 00

## BENEFICIATION:

METHOD: WASHING -----DESCRIPTION OF MILLING-----  
 DESIGN CAPACITY: 4100 ORE/CRUSH/SCRUB/SCREEN/SIZE/CYCLONE  
 UNITS: MT ORE/DAY DESLIME/FILTER/DRY/STORE

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	70	30.23	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: TUNISIA  
 LATITUDE: N 34 15 00 LONGITUDE: E 08 12 00  
 METHOD OF TRANSPORTATION: RAIL DISTANCE (KM): 250  
 DESTINATION FACILITY: CHEMICAL PLANT LOCATION: SFAX, TUNISIA

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: TUNISIA  
 LATITUDE: N 34 15 00 LONGITUDE: E 08 12 00  
 METHOD OF TRANSPORTATION: RAIL DISTANCE (KM): 300  
 DESTINATION FACILITY: CHEMICAL PLANT LOCATION: GABES, TUNISIA

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SRI INTERNATIONAL. PHOSPHATE ROCK. CHEMICAL ECONOMICS HANDBOOK, MARCH 1980.



**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS
COLL OF HANE	PHOSPHATES
CALCITE	CARBONATES
URANINITE	OXIDES (EXCLUDING SiO <sub>2</sub> )
DAHLLITE	PHOSPHATES

**MINE/MILL INFORMATION****SURFACE MINING:****PILOT PLANT**

METHOD: STRIPPING

**DESCRIPTION OF COVER:**

SAND, SILT;

HARD ROCKS

**TRANSPORTATION (ORE):**

ORIGINATING FACILITY: MINE

LOCATION: TURKEY

LATITUDE: N 37 30 00

LONGITUDE: E 40 30 00

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: TRUCK

DISTANCE (KM): 2

DESTINATION FACILITY: MILL (ON-SITE)

LOCATION: TURKEY

LATITUDE: N 37 30 00

LONGITUDE: E 40 30 00

**BENEFICIATION:**

METHOD: SIZING

**----- DESCRIPTION OF MILLING -----  
ORE/ CRUSH/SCREEN/CULL/DRY**

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	48	30	WT-PCT

**TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK**

ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: TURKEY

LATITUDE: N 37 30 00 LONGITUDE: E 40 30 00

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: TRUCK DISTANCE (KM): 220

DESTINATION FACILITY: REFINERY LOCATION: ELAZIG, TURKEY

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U. S. BUREAU OF MINES. REPORT AND RECOMMENDATIONS ON PHOSPHATE DEVELOPMENT IN TURKEY (PROCESSING). JUNE 1978.

U.S.S.R.LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: KOASHVA

SEQUENCE NUMBER: 4610000028

NATION: USSR

TYPE OF OPERATION: UNDERGROUND

LATITUDE: N 67 DEG 45 MIN 00 SEC

UTM - ZONE: 36 HEMISPHERE: NORTHERN

POINT OF REFERENCE: ORE BODY

ELEVATION: 1100 METERS

DATUM: SEA LEVEL

CURRENT STATUS: PRODUCER

LONGITUDE: E 33 DEG 44 MIN 00 SEC

NORTHING: 7514991 EASTING: 530988

PRECISION: 100 METERS

YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

NIORPAKH

APATIT COMBINE

KHIBINY MASSIF

VOSTOCHNY

## OWNERSHIP

APATIT PRODUCTION ASSOC./KOLA COMBINE (GOVT. BUREAU)

GOVERNMENT OF U.S.S.R.

## STATUS

OPERATOR

OWNER

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1926

## -----EXPLORATION METHODS-----

YEAR OF INITIAL PRODUCTION: 1980

CORE DRILLING/GEOPHYSICAL

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: PHOSPHATE-BEARING LAYERS WITHIN A SYENITE PLUTON

SHAPE OF ORE BODY: TABULAR; MASSIVE

CONTROLLING FEATURES: IGNEOUS

## MINERALIZED ZONE:

AVERAGE DEPTH: 200 METERS

AVERAGE THICKNESS: 200 METERS

## LITHOLOGY:

DEFORMATION DESCRIPTION: INTRUSION

GEOLOGIC AGE: PALEOZOIC

ROCK TYPE:

SYENITE ENCLOSSES ORE

## MINERALIZATION:

MINERAL NAME  
APATITEMINERAL CLASS  
PHOSPHATES

MINE/MILL INFORMATION

## UNDERGROUND MINING:

METHOD: SHRINKAGE METHODS  
 CAPACITY: 10800

UNITS: MT ORE/DAY

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE  
 LATITUDE: N 67 45 00  
 METHOD OF TRANSPORTATION: RAIL  
 DESTINATION FACILITY: MILL (OFF-SITE)  
 LATITUDE: N 67 42 00

LOCATION: KOLA PENINSULA (USSR)  
 LONGITUDE: E 33 44 00  
 LOCATION: KOLA PENINSULA (USSR)  
 LONGITUDE: E 33 24 00

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE  
 LATITUDE: N 67 45 00  
 METHOD OF TRANSPORTATION: RAIL  
 DESTINATION FACILITY: MILL (OFF-SITE)  
 LATITUDE: N 67 40 00

LOCATION: KOLA PENINSULA (USSR)  
 LONGITUDE: E 33 44 00  
 LOCATION: KOLA PENINSULA (USSR)  
 LONGITUDE: E 33 35 00

## BENEFICIATION:

METHOD: FLOTATION

-----DESCRIPTION OF MILLING-----  
ORE/CRUSH/GRIND/FLOAT

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	89	39.5	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (OFF-SITE) LOCATION: KOLA PENINSULA (USSR)  
 PERCENT SHIPPED: 100  
 METHOD OF TRANSPORTATION: RAIL  
 DESTINATION FACILITY: FOB MILL

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: TSENTRALNYY

SEQUENCE NUMBER: 4610000029

NATION: USSR

TYPE OF OPERATION: SURFACE

LATITUDE: N 67 DEG 45 MIN 00 SEC

UTM - ZONE: 36 HEMISPHERE: NORTHERN

POINT OF REFERENCE: ORE BODY

ELEVATION: 1100 METERS

DATUM: SEA LEVEL

CURRENT STATUS: PRODUCER

LONGITUDE: E 33 DEG 44 MIN 00 SEC

NORTHING: 7514991 EASTING: 530988

PRECISION: 100 METERS

YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

TSENTRALNY

KOLA COMBINE

APATITE CIRCUS

KHIBINY MASSIF

## OWNERSHIP

GOVERNMENT OF U.S.S.R.

APATIT PRODUCTION ASSOC./

KOLA COMBINE (GOVT. BUREAU)

## STATUS

OWNER

OPERATOR

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1926

## -----EXPLORATION METHODS-----

YEAR OF INITIAL PRODUCTION: 1964

CORE DRILLING/GEOPHYSICAL

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: PHOSPHATE-BEARING LAYERS WITHIN A SYENITE PLUTON

SHAPE OF ORE BODY: TABULAR; MASSIVE

CONTROLLING FEATURES: IGNEOUS

MINERALIZED ZONE:

AVERAGE DEPTH: 200 METERS

AVERAGE THICKNESS: 200 METERS

LITHOLOGY:

DEFORMATION DESCRIPTION: INTRUSION

GEOLOGIC AGE: PALEOZOIC

ROCK TYPE:

SYENITE ENCLOSSES ORE

MINERALIZATION:

MINERAL NAME

MINERAL CLASS

APATITE

PHOSPHATES

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: OPEN-PIT  
CAPACITY: 70800

UNITS: MT ORE/DAY

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE  
LATITUDE: N 67 45 00  
METHOD OF TRANSPORTATION: TRUCK  
DESTINATION FACILITY: MILL (OFF-SITE)  
LATITUDE: N 67 42 00

LOCATION: KOLA PENINSULA (USSR)  
LONGITUDE: E 33 44 00  
LOCATION: KOLA PENINSULA (USSR)  
LONGITUDE: E 33 24 00

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE  
LATITUDE: N 67 45 00  
METHOD OF TRANSPORTATION: TRUCK  
DESTINATION FACILITY: MILL (OFF-SITE)  
LATITUDE: N 67 40 00

LOCATION: KOLA PENINSULA (USSR)  
LONGITUDE: E 33 44 00  
LOCATION: KOLA PENINSULA (USSR)  
LONGITUDE: E 33 35 00

## BENEFICIATION:

METHOD: FLOTATION

-----DESCRIPTION OF MILLING-----  
ORE/CRUSH/GRIND/FLOAT

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	81	39.5	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (OFF-SITE) LOCATION: KOLA PENINSULA (USSR)  
PERCENT SHIPPED: 100  
METHOD OF TRANSPORTATION: RAIL  
DESTINATION FACILITY: FOB MILL

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: MOSCOW REGION

SEQUENCE NUMBER: 4610000030

NATION: USSR

SUBDIVISION: UNKNOWN

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 55 DEG 20 MIN 00 SEC

LONGITUDE: E 39 DEG 00 MIN 00 SEC

UTM - ZONE: 37 HEMISPHERE: NORTHERN

NORTHING: 6131670 EASTING: 500000

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

YEGORIEVSK MINE

LEPATINSK MINE

VOSKRESENSK MINE

PODMOSKOVSK

## OWNERSHIP

GOVERNMENT OF U.S.S.R.

## STATUS

OWNER-OPERATOR

## COMMUNITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

YEAR OF INITIAL PRODUCTION: 1920

-----EXPLORATION METHODS-----  
GEOPHYSICALGEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

## LITHOLOGY:

GEOLOGIC AGE: UPPER JURASSIC

ROCK TYPE:

PHOSPHORITE

IS ORE

SAND

NEAR ORE; ENCLOSSES ORE

CLAY

NEAR ORE; ENCLOSSES ORE

COQUINA

NEAR ORE; LIES UNDER ORE

## MINERALIZATION:

MINERAL NAME

MINERAL CLASS

COLLOPHANE

PHOSPHATES

GLAUCONITE

SILICATES

MINE/MILL INFORMATION  
TWO MINES FEEDING ONE MILL.

SURFACE MINING:

METHOD: OPEN-PIT

TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE

LOCATION: USSR

LATITUDE: N 55 20 00

LONGITUDE: E 39 00 00

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: RAIL

DESTINATION FACILITY: MILL (OFF-SITE) LOCATION: PODMOSKOVSK-U.S.S.R.

LATITUDE: N 55 23 00

LONGITUDE: E 39 02 00

BENEFICIATION:

METHOD: FLOTATION

----- DESCRIPTION OF MILLING -----  
ORE/GRINDING/FLOTATION/PRODUCT

PRODUCT	ASSAY FORM	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	26.75	WT-PCT

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (OFF-SITE) LOCATION: PODMOSKOVSK-U.S.S.R.

LATITUDE: N 55 23 00

LONGITUDE: E 39 02 00

PERCENT SHIPPED: 100

DESTINATION FACILITY: MARKET

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UNIVERSITY PRESS, NEW YORK AND LONDON, 1969, P. 101.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: MOLODEZHNYY (RASVUMCHORR) SEQUENCE NUMBER: 4610000033

NATION: USSR  
 TYPE OF OPERATION: SURFACE-UNDERGROUND  
 LATITUDE: N 67 DEG 45 MIN 00 SEC  
 UTM - ZONE: 36 HEMISPHERE: NORTHERN  
 POINT OF REFERENCE: ORE BODY  
 ELEVATION: 1100 METERS  
 DATUM: SEA LEVEL

CURRENT STATUS: PRODUCER  
 LONGITUDE: E 33 DEG 44 MIN 00 SEC  
 NORTHING: 7514991 EASTING: 530988  
 PRECISION: 100 METERS  
 YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

RASVUMCHORR PLATEAU  
 KHIEINY MASSIF  
 APATIT COMBINE  
 APATIT PRODUCTION ASSOCIATION  
 KOLA COMBINE

## OWNERSHIP

GOVERNMENT OF U.S.S.R.  
 APATIT PRODUCTION ASSOC.  
 KOLA COMBINE (GOVT. BUREAU)

## STATUS

OWNER  
 OPERATOR

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1926

## -----EXPLORATION METHODS-----

YEAR OF INITIAL PRODUCTION: 1955

CORE DRILLING/GEOPHYSICAL

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: PHOSPHATE-BEARING LAYERS WITHIN A SYENITE PLUTON  
 SHAPE OF ORE BODY: TABULAR; MASSIVE

CONTROLLING FEATURES: IGNEOUS

## MINERALIZED ZONE:

AVERAGE DEPTH: 200 METERS

AVERAGE THICKNESS: 200 METERS

## LITHOLOGY:

DEFORMATION DESCRIPTION: INTRUSION

GEOLOGIC AGE: PALEOZOIC

ROCK TYPE:

SYENITE ENCLOSSES ORE

## MINERALIZATION:

MINERAL NAME  
 APATITE

MINERAL CLASS  
 PHOSPHATES

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: OPEN-PIT  
 CAPACITY: 4100

UNITS: MT ORE/DAY

## UNDERGROUND MINING:

METHOD: BLOCK CAVING  
 CAPACITY: 14400

UNITS: MT ORE/DAY

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE  
 LATITUDE: N 67 45 00  
 METHOD OF TRANSPORTATION: RAIL  
 DESTINATION FACILITY: MILL (OFF-SITE)  
 LATITUDE: N 67 42 00

LOCATION: KOLA PENINSULA (USSR)  
 LONGITUDE: E 33 44 00

LOCATION: KOLA PENINSULA (USSR)  
 LONGITUDE: E 33 24 00

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE  
 LATITUDE: N 67 45 00  
 METHOD OF TRANSPORTATION: RAIL  
 DESTINATION FACILITY: MILL (OFF-SITE)  
 LATITUDE: N 67 40 00

LOCATION: KOLA PENINSULA (USSR)  
 LONGITUDE: E 33 44 00

LOCATION: KOLA PENINSULA (USSR)  
 LONGITUDE: E 33 35 00

## BENEFICIATION:

METHOD: FLOTATION

-----DESCRIPTION OF MILLING-----  
 ORE/CRUSH/GRIND/FLOAT

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	82	39.5	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (OFF-SITE) LOCATION: KOLA PENINSULA (USSR)

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: RAIL

DESTINATION FACILITY: MARKET

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: OSHURKOV

SEQUENCE NUMBER: 4610120008

NATION: USSR

SUBDIVISION: BURYATSKAYA A.S.S.R.

TYPE OF OPERATION: SURFACE

CURRENT STATUS: DEVELOPING DEPOSIT

LATITUDE: N 51 DEG 44 MIN 00 SEC

LONGITUDE: E 107 DEG 30 MIN 00 SEC

UTM - ZONE: 48 HEMISPHERE: NORTHERN

NORTHING: 5734119 EASTING: 672637

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 750 METERS

YEAR OF INFORMATION: 1981

DATUM: SEA LEVEL

## ALTERNATE NAMES

OSHURKOV PHOSPHATE MINE

## OWNERSHIP

PRODUCTION UNION ZABAYKALSKIY (USSR - STATE OWNED)

## STATUS

OWNER-OPERATOR

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

INDICATED	RECORD 1
UNITS	500,000,000
YEAR/DATA	MT ORE
	1979

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	4.7	WT-PCT

## RESERVE-RESOURCE - REMARKS

## SOURCE FOR RECORD 1:

NORTHLIT, ARTHUR J.G. THE ECONOMIC GEOLOGY AND DEVELOPMENT OF IGNEOUS PHOSPHATE DEPOSITS IN EUROPE AND THE U.S.S.R. ECONOMIC GEOLOGY, 74 (2), 1979, PP. 339-350.

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1962

-----EXPLORATION METHODS-----  
GEOPHYSICALGEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: REPLACEMENT

MODE OF ORIGIN: CONTACT METASOMATIC

CONTROLLING FEATURES: IGNEOUS

MINERALIZED ZONE:

MINIMUM DEPTH: 0 METERS

AVERAGE WIDTH: 1000 METERS

AVERAGE LENGTH: 3500 METERS

AVERAGE THICKNESS: 100 METERS

**LITHOLOGY:**

NAME OF FORMATION: OSHURKOV COMPLEX  
DEFORMATION DESCRIPTION: METAMORPHISM; INTRUSION  
GEOLOGIC AGE: PRECAMBRIAN  
ROCK TYPE:  
DIORITE ENCLOSES ORE

**MINERALIZATION:**

MINERAL NAME	MINERAL CLASS
APATITE	PHOSPHATES

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CONGER, D. SIBERIA: RUSSIA'S FROZEN FRONTIER. NATIONAL GEOGRAPHIC, 131 (3), 1967, PP. 297-347.

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STEWART, J. M. SIBERIA, OPTIMA, 26 (2), 1976, PP. 85-104.

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: KARA TAU DEPOSITS

SEQUENCE NUMBER: 4610150007

NATION: USSR

SUBDIVISION: CHITA A.S.S.R.

TYPE OF OPERATION: SURFACE-UNDERGROUND

CURRENT STATUS: PRODUCER

LATITUDE: N 43 DEG 20 MIN 00 SEC

LONGITUDE: E 70 DEG 15 MIN 00 SEC

UTM - ZONE: 42 HEMISPHERE: NORTHERN

NORTHING: 4798375 EASTING: 601336

POINT OF REFERENCE: ORE BODY

YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

AK SAI

CHULUK TAU

DZANATASS

KOK DZHON

KOK SU

## OWNERSHIP

KARATAU COMBINE (USSR - STATE OWNED)

## STATUS

OWNER-OPERATOR

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

## RECORD 1

MEASURED	264,000,000
INDICATED	536,000,000
INFERRRED	640,000,000
UNITS	MT ORE
YEAR/DATA	1977

## RESERVE-RESOURCE - REMARKS

## SOURCE FOR RECORD 1:

STRISHKOV, E.M. MINERAL INDUSTRIES OF THE U.S.S.R. BUREAU  
OF MINES, U.S. DEPT. OF INTERIOR, PUBLICATION MP-2, 1977, 19 PP.

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1936

## -----EXPLORATION METHODS-----

YEAR OF INITIAL PRODUCTION: 1942

GEOPHYSICAL/STREAM SEDIMENT SAMPLING

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDING

MINERALIZED ZONE:

AVERAGE LENGTH: 5000 METERS

AVERAGE WIDTH: 430 METERS

AVERAGE THICKNESS: 10 METERS

STRIKE/DIP: N45W/85N

**LITHOLOGY:**

NAME OF FORMATION: CHULUK TAU  
 ROCK TYPE:  
 UNSPECIFIED SEDIMENTARY IS ORE

GEOLOGIC AGE: MIDDLE CAMBRIAN

**MINERALIZATION:**

MINERAL NAME MINERAL CLASS  
 APATITE PHOSPHATES

MINE/MILL INFORMATION**SURFACE MINING:**

METHOD: OPEN-PIT  
 CAPACITY: 29600 UNITS: MT ORE/DAY

**TRANSPORTATION (ORE):**

ORIGINATING FACILITY: MINE

LOCATION: KARA TAU MT. RANGE

LATITUDE: N 43 20 00

LONGITUDE: E 70 15 00

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: RAIL

DESTINATION FACILITY: MILL (OFF-SITE)

LOCATION: KARA TAU CITY, USSR

**UNDERGROUND MINING:**

METHOD: OPEN STOPE METHODS  
 CAPACITY: 7400

UNITS: MT ORE/DAY

**TRANSPORTATION (ORE):**

ORIGINATING FACILITY: MINE

LOCATION: KARA TAU MT. RANGE

LATITUDE: N 43 20 00

LONGITUDE: E 70 15 00

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: RAIL

DESTINATION FACILITY: MILL (OFF-SITE)

LOCATION: KARA TAU CITY, USSR

**BENEFICIATION:**

METHOD: FLOTATION  
 DESIGN CAPACITY: 37000  
 UNITS: MT ORE/DAY

-----DESCRIPTION OF MILLING-----  
 ORE/CRUSH/GRIND/FLOAT

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	60	28	WT-PCT

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: CHILIKSAY

SEQUENCE NUMBER: 4610320029

NATION: USSR

SUBDIVISION: KAZAKISTAN

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 50 DEG 17 MIN 00 SEC

LONGITUDE: E 57 DEG 10 MIN 00 SEC

UTM - ZONE: 40 HEMISPHERE: NORTHERN

NORTHING: 5569928 EASTING: 511874

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 300 METERS

PRECISION: 100 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

AKTYUDINSK

## OWNERSHIP

GOVERNMENT OF U.S.S.R.

## STATUS

OWNER-OPERATOR

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

## RECORD 1

INDICATED 269,000,000

INFERRED 731,000,000

UNITS MT ORE

YEAR/DATA 1980

## RESERVE-RESOURCE - REMARKS

RECORD 1: NO GRADE REPORTED.

## SOURCE FOR RECORD 1:

BRITISH SULPHUR CORPORATION. WORLD SURVEY OF PHOSPHATE DEPOSITS. LONDON, 1980.

DEPOSIT HISTORICAL INFORMATION

YEAR OF DISCOVERY: 1929

YEAR OF INITIAL PRODUCTION: 1980

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDING

## MINERALIZED ZONE:

AVERAGE DEPTH: 10 METERS

MINIMUM DEPTH: 5 METERS

AVERAGE THICKNESS: 0.6 METER

## UNCONSOLIDATED MATERIAL:

AVERAGE THICKNESS: 5 METERS

## LITHOLOGY:

NAME OF FORMATION: BEDS OF SANTONIAN AGE      GEOLOGIC AGE: UPPER CRETACEOUS  
 ROCK TYPE:

PHOSPHORITE	IS ORE
SAND	LIES OVER ORE; LIES UNDER ORE
SILT	LIES OVER ORE
CLAY	LIES OVER ORE; NEAR ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS	GRAIN SIZE
COLLOPHANE	PHOSPHATES	VARIABLE
GLAUCONITE	SILICATES	VARIABLE

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: OPEN-PIT

CAPACITY: 18200 UNITS: MT ORE/DAY

## DESCRIPTION OF COVER:

SAND, SILT; QUICKSAND

AVERAGE COVER THICKNESS: 10 METERS

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE LOCATION: USSR

LATITUDE: N 50 17 00 LONGITUDE: E 57 10 00

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: TRUCK

DESTINATION FACILITY: MILL (ON-SITE) LOCATION: USSR

LATITUDE: N 50 17 00 LONGITUDE: E 57 10 00

## BENEFICIATION:

METHOD: FLOTATION ----- DESCRIPTION OF MILLING -----

DESIGN CAPACITY: 18200 ORE/WASH/GRIND/FLOAT/FILTER/DRY/GRIND/  
UNITS: MT ORE/DAY SHIP PRODUCT

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	73	23.5	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: USSR

LATITUDE: N 50 17 00 LONGITUDE: E 57 10 00

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: RAIL

DESTINATION FACILITY: MARKET LOCATION: USSR

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: KOVDOR

SEQUENCE NUMBER: 4610380025

NATION: USSR

SUBDIVISION: KOLA PENINSULA

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 67 DEG 34 MIN 00 SEC

LONGITUDE: E 30 DEG 22 MIN 00 SEC

UTM - ZONE: 36 HEMISPHERE: NORTHERN

NORTHING: 7496750 EASTING: 387881

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 750 METERS

YEAR OF INFORMATION: 1981

DATUM: SEA LEVEL

## ALTERNATE NAMES

KHIBNY MASSIF

APATIT PRODUCTION ASSOCIATION

KOLA COMBINE

## OWNERSHIP

GOVERNMENT OF U.S.S.R.

## STATUS

APATIT PRODUCTION ASSOC./KOLA COMBINE (GOVT. BUREAU)

OWNER

OPERATOR

## COMMODITY

## MARKETABILITY

MAGNETITE

PRIMARY PRODUCT

PHOSPHATE

BYPRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

INDICATED	RECORD 1
UNITS	708,000,000
YEAR/DATA	MT ORE
	1979

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	6.6	WT-PCT

## RESERVE-RESOURCE - REMARKS

## SOURCE FOR RECORD 1:

NOTHOLT, ARTHUR J.G. THE ECONOMIC GEOLOGY AND DEVELOPMENT  
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 GEOLOGY, 74 (2), 1979, PP. 339-350.

DEPOSIT HISTORICAL INFORMATION

YEAR OF INITIAL PRODUCTION: 1964

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

SHAPE OF ORE BODY: TABULAR; LENTICULAR

CONTROLLING FEATURES: IGNEOUS

MINERALIZED ZONE:  
STRIKE/DIP: N01E/90

LITHOLOGY: DEFORMATION DESCRIPTION: INTRUSION GEOLOGIC AGE: MIDDLE DEVONIAN  
ROCK TYPE: ALKALIC IGNEOUS ENCLOSSES ORE

**MINERALIZATION:** MINERAL NAME APATITE **MINERAL CLASS** PHOSPHATES

## MINE/MILL INFORMATION

SURFACE MINING:  
METHOD: OPEN-PIT  
CAPACITY: 10500 UNITS: MT ORE/DAY

TRANSPORTATION (OPE):  
ORIGINATING FACILITY: MINE LOCATION: KOLA PENINSULA (USSR)  
LATITUDE: N 67 34 00 LONGITUDE: E 30 22 00  
PERCENT SHIPPED: 100  
DESTINATION FACILITY: MILL (ON-SITE) LOCATION: KOLA PENINSULA (USSR)  
LATITUDE: N 67 34 00 LONGITUDE: E 30 22 00

BENEFICIATION:  
METHOD: FLOTATION  
DESIGN CAPACITY: 10500  
UNITS: MT ORE/CAY

-----DESCRIPTION OF MILLING-----  
ORE/MAGNETITE CONCENTRATION/FLOTATION/  
FILTER/DRY/GRIND

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
FMC SFHATE ROCK	P205	74	35	WT-PCT

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK  
ORIGINATING FACILITY: MILL (ON-SITE) LOCATION: KOLA PENINSULA (USSR)  
LATITUDE: N 67 34 00 LONGITUDE: E 30 22 00  
PERCENT SHIPPED: 100  
METHOD OF TRANSPORTATION: RAIL LOCATION: LENINGRAD (USSR)

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LONDON.

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: VIATKA-KAMA

SEQUENCE NUMBER: 4610400001

NATION: USSR

SUBDIVISION: KOMI S.S.R.

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 57 DEG 55 MIN 00 SEC

LONGITUDE: E 57 DEG 55 MIN 00 SEC

UTM - ZONE: 40 HEMISPHERE: NORTHERN

NORTHING: 6419589 EASTING: 554310

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

YEAR OF INFORMATION: 1981

OWNERSHIP:

STATUS

GOVERNMENT OF U.S.S.R.

OWNER-OPERATOR

COMMODITY

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

RECORD 1

INDICATED 10,000,000,000

UNITS MT ORE

YEAR/DATA 1980

RESERVE-RESOURCE - REMARKS

RECORD 1: NO GRADE REPORTED.

SOURCE FOR RECORD 1:

BRITISH SULPHUR. WORLD SURVEY OF PHOSPHATE DEPOSITS. 4TH EDITION, PP. 214, 218, AND 219.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD:

GEOPHYSICAL ANOMALY

YEAR OF DISCOVERY: 1917

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

MINERALIZED ZONE:

AVERAGE THICKNESS: 0.7 METER

## LITHOLOGY:

GEOLOGIC AGE: LOWER CRETACEOUS  
 ROCK TYPE:  
 PHOSPHORITE IS ORE  
 SAND LIES OVER ORE; NEAR ORE  
 SILT LIES OVER ORE  
 CLAY LIES OVER ORE; LIES UNDER ORE  
 CHERT NEAR ORE; ENCLOSSES ORE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
GLAUCONITE	SILICATES
CHERT	FORMS OF SiO <sub>2</sub>
PYRITE	SULFIDES

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: OPEN-PIT

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE	LOCATION: USSR
LATITUDE: N 57 55 00	LONGITUDE: E 57 55 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: RAIL	
DESTINATION FACILITY: MILL (OFF-SITE)	LOCATION: USSR

## BENEFICIATION:

METHOD: FLOTATION	----- DESCRIPTION OF MILLING -----
	ORE/CRUSH/SCREEN/GRIND/FLOAT/FILTER/DRY/
	LOAD & TRANSPORT/MARKET

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	80	28	WT-PCT

TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK  
 ORIGINATING FACILITY: MILL (OFF-SITE)  
 PERCENT SHIPPED: 100  
 METHOD OF TRANSPORTATION: RAIL  
 DESTINATION FACILITY: MARKET

BIBLIOGRAPHY RECORDS

BRITISH SULPHUR. WORLD SURVEY OF PHOSPHATE DEPOSITS. 4TH EDITION, PP. 214, 218, AND 219.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: KINGISEPP

SEQUENCE NUMBER: 4610480001

NATION: USSR

SUBDIVISION: LENINGRAD

TYPE OF OPERATION: SURFACE

CURRENT STATUS: PRODUCER

LATITUDE: N 58 DEG 45 MIN 00 SEC

LONGITUDE: E 27 DEG 30 MIN 00 SEC

UTM - ZONE: 35 HEMISPHERE: NORTHERN

NORTHING: 6512113 EASTING: 528935

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING

LOCATED CLAIM; PATENTED CLAIM

## ALTERNATE NAMES

KINGISEPP APATIT GROUP

MAARDU

TOOLSE

BALTIC REGION

## OWNERSHIP

GOVERNMENT OF U.S.S.R.

KINGISEPP PHOSPHATE ASSOC.

## STATUS

OWNER

OPERATOR

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

INDICATED	RECORD 1
UNITS	318,300,000
YEAR/DATE	MT ORE 1980

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	F205	6.2	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORD 1: RESERVE TONNAGE IS TOTAL OF MAARDU, TOOLSE, AND KINGISEPP.

## SOURCE FOR RECORD 1:

BRITISH SULPHUR CORPORATION. WORLD SURVEY OF PHOSPHATE DEPOSITS. LONDON, 1980.

PHOSPHORUS &amp; POTASSIUM. NEWS ITEM REGARDING U.S.S.R. NO. 112 (MARCH/APRIL), BRITISH SULPHUR CORPORATION, 1981.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

ORE-MINERAL IN PLACE

## -----EXPLORATION METHODS-----

YEAR OF DISCOVERY: 1963

GEOPHYSICAL/CORE DRILLING

YEAR OF INITIAL PRODUCTION: 1963

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY  
 MODE OF ORIGIN: SEDIMENTATION  
 SHAPE OF ORE BODY: TABULAR

## MINERALIZED ZONE:

AVERAGE DEPTH: 19 METERS  
 AVERAGE THICKNESS: 2.2 METERS

## LITHOLOGY:

NAME OF FORMATION:	BEDS OF TERMADOCIAN AGE	GEOLOGIC AGE:	LOWER ORDOVICIAN
ROCK TYPE:			
PHOSPHORITE	IS ORE		
SANDSTONE	NEAR ORE; ENCLOSSES ORE		
LIMESTONE	GANGUE; NEAR ORE		
COQUINA	LIES UNDER ORE; NEAR ORE		
DOLOMITE	LIES OVER ORE; NEAR ORE		
SCHIST	NEAR ORE		
SAND	LIES OVER ORE; NEAR ORE		

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
DOLOMITE	CARBONATES
GLAUCONITE	SILICATES

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: STRIPPING

## TRANSPORTATION (ORE):

ORIGINATING FACILITY:	MINE	LOCATION:	USSR
LATITUDE:	N 58 45 00	LONGITUDE:	E 27 30 00
PERCENT SHIPPED:	100		
METHOD OF TRANSPORTATION:	TRUCK		
DESTINATION FACILITY:	MILL (ON-SITE)	LOCATION:	USSR
LATITUDE:	N 58 45 00	LONGITUDE:	E 27 30 00

## BENEFICIATION:

METHOD: FLOTATION

----- DESCRIPTION OF MILLING -----  
 ORE/GRIND/MILL/FLOAT/SHIP CONCENTRATE

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	79	28.5	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY:	MILL (ON-SITE)	LOCATION:	USSR
LATITUDE:	N 58 45 00	LONGITUDE:	E 27 30 00
PERCENT SHIPPED:	100		
DESTINATION FACILITY:	MARKET	LOCATION:	USSR

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SHABAD, T. BASIC INDUSTRIAL RESOURCES OF THE U.S.S.R. COLUMBIA UNIVERSITY PRESS, NEW YORK AND LONDON, 1979, 108 PP.

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: KIROV MINE (KUKISVUMCHORSK) SEQUENCE NUMBER: 4610530033  
NATION: USSR SUBDIVISION: MORDAVIAN A.S.S.R.  
TYPE OF OPERATION: SURFACE-UNDERGROUND CURRENT STATUS: PRODUCER  
LATITUDE: N 67 DEG 45 MIN 00 SEC LONGITUDE: E 33 DEG 44 MIN 00 SEC  
UTM - ZONE: 36 HEMISPHERE: NORTHERN NORTHING: 7514991 EASTING: 530988  
POINT OF REFERENCE: ORE BODY  
ELEVATION: 1100 METERS PRECISION: 100 METERS  
DATUM: SEA LEVEL YEAR OF INFORMATION: 1981

ALTERNATE NAMES  
KUKISVUMCHORSK  
KHIBNY MASSIF  
APATIT COMBINE

OWNERSHIP  
GOVERNMENT OF U.S.S.R.  
APATIT PRODUCTION ASSOC./  
KOLA COMBINE (GOVT. BUREAU)

**COMMODITY** **MARKETABILITY**  
**PHOSPHATE** **PRIMARY PRODUCT**

PUBLISHED RESERVE RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

DISCOVERY METHOD: UNKNOWN  
YEAR OF DISCOVERY: 1926  
YEAR OF INITIAL PRODUCTION: 1926

-----EXPLORATION METHODS-----  
CORE DRILLING/GEOPHYSICAL

## GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: PHOSPHATE-BEARING LAYERS WITHIN A SYENITE PLUTON  
SHAPE OF ORE BODY: TABULAR; MASSIVE  
CONTROLLING FEATURES: IGNEOUS

LITHOLOGY: GEOLOGIC AGE: PALEOZOIC  
DEFORMATION DESCRIPTION: INTRUSION  
ROCK TYPE: SYENITE ENCLOSES ORE

MINERALIZATION: MINERAL NAME APATITE MINERAL CLASS PHOSPHATES

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: OPEN-PIT

CAPACITY: 19000

PERCENT WASTE ROCK: 35.8

UNITS: MT ORE/DAY

## UNDERGROUND MINING:

METHOD: SHRINKAGE METHODS

CAPACITY: 25,000

UNITS: MT ORE/DAY

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE

LATITUDE: N 67 45 00

METHOD OF TRANSPORTATION: TRUCK

DESTINATION FACILITY: MILL (OFF-SITE)

LATITUDE: N 67 42 00

LOCATION: KOLA PENINSULA (USSR)

LONGITUDE: E 33 44 00

DISTANCE (KM): 2

LOCATION: KOLA PENINSULA (USSR)

LONGITUDE: E 33 24 00

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE

LATITUDE: N 67 45 00

METHOD OF TRANSPORTATION: RAIL

DESTINATION FACILITY: MILL (OFF-SITE)

LATITUDE: N 67 40 00

LOCATION: KOLA PENINSULA (USSR)

LONGITUDE: E 33 44 00

LOCATION: KOLA PENINSULA (USSR)

LONGITUDE: E 33 35 00

## BENEFICIATION:

METHOD: FLOTATION

-----DESCRIPTION OF MILLING-----  
ORE/CRUSH/GRIND/FLOAT

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	F205	82	39.5	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (OFF-SITE)

LATITUDE: N 67 42 00

METHOD OF TRANSPORTATION: RAIL

DESTINATION FACILITY: FOB MILL

LOCATION: KOLA PENINSULA (USSR)

LONGITUDE: E 33 24 00

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY: MILL (OFF-SITE)

LATITUDE: N 67 40 00

METHOD OF TRANSPORTATION: RAIL

DESTINATION FACILITY: FOB MILL

LOCATION: KOLA PENINSULA (USSR)

LONGITUDE: E 33 35 00

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: YUKSPOR

SEQUENCE NUMBER: 4610530060

NATION: USSR

SUBDIVISION: MORDAVIAN U.S.S.R.

TYPE OF OPERATION: SURFACE-UNDERGROUND

CURRENT STATUS: PRODUCER

LATITUDE: N 67 DEG 45 MIN 00 SEC

LONGITUDE: E 33 DEG 44 MIN 00 SEC

UTM - ZONE: 36 HEMISPHERE: NORTHERN

NORTHING: 7514991 EASTING: 530988

POINT OF REFERENCE: ORE BODY

PRECISION: 100 METERS

ELEVATION: 1100 METERS

YEAR OF INFORMATION: 1981

DATUM: SEA LEVEL

## ALTERNATE NAMES

YUKSFORSK

KHIBINY MASSIF

APATIT COMBINE

## OWNERSHIP

GOVERNMENT OF U.S.S.R.

## STATUS

APATIT PRODUCTION ASSOC./

OWNER

KOLA COMBINE (USSR-STATE OWNED)

OPERATOR

## COMMODITY

PHOSPHATE

## MARKETABILITY

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

NO PUBLISHED RESERVES HAVE BEEN LOCATED FOR THIS DEPOSIT.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

## -----EXPLORATION METHODS-----

YEAR OF DISCOVERY: 1926

CORE DRILLING/GEOPHYSICAL

YEAR OF INITIAL PRODUCTION: 1955

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: PHOSPHATE-BEARING LAYERS WITHIN A SYENITE PLUTON

SHAPE OF ORE BODY: TABULAR; MASSIVE

CONTROLLING FEATURES: IGNEOUS

## MINERALIZED ZONE:

AVERAGE DEPTH: 200 METERS

AVERAGE THICKNESS: 200 METERS

## LITHOLOGY:

DEFORMATION DESCRIPTION: INTRUSION

GEOLOGIC AGE: PALEOZOIC

ROCK TYPE:

SYENITE

ENCLOSES ORE

## MINERALIZATION:

MINERAL NAME

MINERAL CLASS

APATITE

PHOSPHATES

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: OPEN-PIT  
 CAPACITY: 1200

UNITS: MT ORE/DAY

## UNDERGROUND MINING:

METHOD: BLOCK CAVING  
 CAPACITY: 15,000

UNITS: MT ORE/DAY

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE  
 LATITUDE: N 67 45 00  
 METHOD OF TRANSPORTATION: RAIL  
 DESTINATION FACILITY: MILL (OFF-SITE)  
 LATITUDE: N 67 40 00

LOCATION: KOLA PENINSULA (USSR)  
 LONGITUDE: E 33 44 00  
 LOCATION: KOLA PENINSULA (USSR)  
 LONGITUDE: E 33 35 00

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE  
 LATITUDE: N 67 45 00  
 METHOD OF TRANSPORTATION: RAIL  
 DESTINATION FACILITY: MILL (OFF-SITE)  
 LATITUDE: N 67 40 00

LOCATION: KOLA PENINSULA (USSR)  
 LONGITUDE: E 33 44 00  
 LOCATION: KOLA PENINSULA (USSR)  
 LONGITUDE: E 33 35 00

## BENEFICIATION:

METHOD: FLOTATION

-----DESCRIPTION OF MILLING-----  
 ORE/CRUSH/GRIND/FLOAT

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	81	39.5	WT-PCT

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LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: SELIGDAR

SEQUENCE NUMBER: 4610930006

NATION: USSR

SUBDIVISION: YAKUTSKAYA A.S.S.R.

TYPE OF OPERATION: UNKNOWN

CURRENT STATUS: EXPLORED DEPOSIT

LATITUDE: N 59 DEG 04 MIN 00 SEC

LONGITUDE: E 125 DEG 24 MIN 00 SEC

UTM - ZONE: 51 HEMISPHERE: NORTHERN

NORTHING: 6549739 EASTING: 637605

POINT OF REFERENCE: ORE BODY

PRECISION: 5 KILOMETERS

YEAR OF INFORMATION: 1981

OWNERSHIP

STATUS

GOVERNMENT OF U.S.S.R.

OWNER

COMMODITY

MODIFIER

MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

IRON

HEMATITE

RECOVERABLE

PUBLISHED RESERVE-RESOURCE INFORMATION

RECORD 1

UNDIFFERENTIATED

100,000,000

UNITS

MT ORE

YEAR/DATA

1980

## RESERVE-RESOURCE - REMARKS

SOURCE FOR RECORD 1:

MINING JOURNAL. VOL 293, NO. 7510, JULY 17, 1979, P. 70.

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

MODE OF ORIGIN: HYDROTHERMAL; CONTACT METASOMATIC

CONTROLLING FEATURES: FAULTING

MINERALIZATION:

MINERAL NAME

MINERAL CLASS

APATITE

PHOSPHATES

BIOTITE

SILICATES

HORNBLENDE

SILICATES

HEMATITE

OXIDES

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## VENEZUELA

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: RIECITO

SEQUENCE NUMBER: 3070210001

NATION: VENEZUELA

SUBDIVISION: FALCON

TYPE OF OPERATION: SURFACE

CURRENT STATUS: TEMPORARY SHUTDOWN

LATITUDE: N 10 DEG 55 MIN 00 SEC

LONGITUDE: E 68 DEG 45 MIN 00 SEC

UTM - ZONE: 42 HEMISPHERE: NORTHERN

NORTHING: 1206701 EASTING: 472680

POINT OF REFERENCE: ORE BODY

PRECISION: 1 KILOMETER

ELEVATION: 608 METERS

PRECISION: 10 METERS

DATUM: SEA LEVEL

YEAR OF INFORMATION: 1981

## ALTERNATE NAMES

MORON

## OWNERSHIP

## STATUS

PETROQUIMICA DE VENEZUELA (VENEZUELAN GOVT.)

OWNER-OPERATOR

## COMMODITY

## MARKETABILITY

PHOSPHATE

PRIMARY PRODUCT

PUBLISHED RESERVE-RESOURCE INFORMATION

RECORD 1

MEASURED

20,000,000

UNITS

MT ORE

YEAR/DATA

1980

## IN SITU GRADE:

RECORD	ASSAY FORM	GRADE	UNIT
1	P205	27	WT-PCT

## RESERVE-RESOURCE - REMARKS

RECORD 1: GRADE RANGES FROM 27 TO 30 PERCENT P205.

## SOURCE FOR RECORD 1:

BRITISH SULPHUR. WORLD SURVEY OF PHOSPHATE DEPOSITS. 1973 AND 1980 EDITIONS.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

## -----EXPLORATION METHODS-----

GEOLOGICAL INFERENCE

CORE DRILLING/TEST PIT/SURFACE

YEAR OF DISCOVERY: 1931

GEOLOGICAL MAPPING/AUGER/

YEAR OF INITIAL PRODUCTION: 1956

RECONNAISSANCE SOIL SAMPLING/

YEAR OF FINAL PRODUCTION: 1979

GEOCHEMICAL

GEOLLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSITS

TYPE OF ORE BODY: BRECCIA FILL  
 MODE OF ORIGIN: SEDIMENTATION  
 SHAPE OF ORE BODY: MASSIVE  
 CONTROLLING FEATURES: FAULTING

## MINERALIZED ZONE:

AVERAGE DEPTH: 21 METERS  
 STRIKE/DIP: S45E/10W

MINIMUM DEPTH: 0 METERS  
 AVERAGE THICKNESS: 14 METERS

## LITHOLOGY:

NAME OF FORMATION: POZON FORMATION      GEOLOGIC AGE: MIocene  
 DEFORMATION DESCRIPTION: MAJOR FAULTING; FAULTING  
 RELATIONSHIP TO MINERALIZATION: MINERALIZATION PRECEDING DEFORMATION

## ROCK TYPE:

LIMESTONE	LIES OVER ORE; GANGUE
BRECCIA	ENCLOSES ORE; IS ORE
SAND	GANGUE

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
COLLORPHANE	PHOSPHATES
QUARTZ	SILICATES

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: OPEN-PIT	
CAPACITY: 2200	UNITS: MT ORE/DAY
DESCRIPTION OF COVER:	HARDNESS OF ORE:
SAND, GRAVEL;	HARD ROCKS
HARD ROCKS	
AVERAGE COVER THICKNESS: 21 METERS	

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE	LOCATION: RIECITO, VENEZUELA
LATITUDE: N 10 55 00	LONGITUDE: E 68 45 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: TRUCK	DISTANCE (KM): 108
DESTINATION FACILITY: MILL (OFF-SITE)	LOCATION: MORON, VENEZUELA

## BENEFICIATION:

METHOD: FLOTATION	----- DESCRIPTION OF MILLING -----
DESIGN CAPACITY: 2273	ORE/CRUSH/WASH/SIZE/FLOAT/DRY
UNITS: MT ORE/DAY	

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	76	32.5	WT-PCT

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MILL (OFF-SITE)	LOCATION: MORON, VENEZUELA
DESTINATION FACILITY: FERTILIZER PLANT	LOCATION: MORON, VENEZUELA

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## WESTERN SAHARA

LOCATION AND GENERAL DEPOSIT INFORMATION

DEPOSIT NAME: BOU CRAA

SEQUENCE NUMBER: 7150000001

NATION: WESTERN SAHARA

SUBDIVISION: NOT SUBDIVIDED

TYPE OF OPERATION: SURFACE

CURRENT STATUS: TEMPORARY SHUTDOWN

LATITUDE: N 26 DEG 21 MIN 00 SEC

LONGITUDE: W 12 DEG 51 MIN 00 SEC

UTM - ZONE: 28 HEMISPHERE: NORTHERN

NORTHING: 2916068 EASTING: 714560

POINT OF REFERENCE: CRE BODY

PRECISION: 1 KILOMETER

YEAR OF INFORMATION: 1981

TYPE OF MINERAL HOLDING  
GOVERNMENT CONTROLLED

## ALTERNATE NAMES

BU CRAA

WESTERN SAHARA

SPANISH SAHARA

## OWNERSHIP

OFFICE CHERIFIEN DES PHOSPHATES  
INSTITUTE NACIONAL DE INDUSTRIA

## STATUS

OWNER

OWNER

COMMUDITY  
PHOSPHATEMARKETABILITY  
PRIMARY PRODUCTPUBLISHED RESERVE-RESOURCE INFORMATION

RECORD 1

MEASURED 1,700,000,000  
UNITS MT CRE  
YEAR/DATA 1980

## RESERVE-RESOURCE - REMARKS

## SOURCE FOR RECORD 1:

ENGINEERING AND MINING JOURNAL. MOROCCO. V. 183, NO. 9, SEPTEMBER 1982, P. 236.

DEPOSIT HISTORICAL INFORMATION

## DISCOVERY METHOD:

-----EXPLORATION METHODS -----  
CRE-MINERAL IN PLACE DRILLING/SAMPLING

YEAR OF DISCOVERY: 1947

YEAR OF INITIAL PRODUCTION: 1962

YEAR OF FINAL PRODUCTION: 1977

GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

TYPE OF ORE BODY: SEDIMENTARY

MODE OF ORIGIN: SEDIMENTATION

SHAPE OF ORE BODY: TABULAR

CONTROLLING FEATURES: BEDDING

## MINERALIZED ZONE:

AVERAGE DEPTH: 18 METERS MINIMUM DEPTH: 0 METERS  
 STRIKE/DIP: N23E/01W AVERAGE THICKNESS: 5.5 METERS

## LITHOLOGY:

NAME OF FORMATION:	MAESTRICHIAN-PALEOCENE	GEOLOGIC AGE:	UPPER CRETACEOUS
ROCK TYPE:			
CHERT	LIES OVER ORE		
LIMESTONE	IS ORE		
LIMESTONE	LIES ALONG ORE; LIES UNDER ORE		

## MINERALIZATION:

MINERAL NAME	MINERAL CLASS
FLUORAPATITE	PHOSPHATES

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD:	STRIPPING	
CAPACITY:	18182	UNITS: MT ORE/DAY

## DESCRIPTION OF COVER:

SAND, SILT;  
 HARD ROCKS

AVERAGE COVER THICKNESS:	18 METERS	PERCENT WASTE ROCK:	76.6
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## TRANSPORTATION (ORE):

ORIGINATING FACILITY:	MINE	LOCATION:	BU CRAA PIT
LATITUDE:	N 26 21 00	LONGITUDE:	W 12 51 00
PERCENT SHIPPED:	100	DISTANCE (KM):	100
METHOD OF TRANSPORTATION:	CONVEYOR	LOCATION:	EL AAIUN PLANT
DESTINATION FACILITY:	MILL (OFF-SITE)		

## BENEFICIATION:

METHOD:	WASHING	----- DESCRIPTION OF MILLING -----
DESIGN CAPACITY:	18182	ORE/CRUSH/WASH/CRUSH/
UNITS:	MT ORE/DAY	DESLIME BY CYCLONES/WASH/FILTER DRY/
		THERMAL DRY STOCKPILE

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	P205	67	36.6	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY:	MILL (OFF-SITE)	LOCATION:	EL AAIUN PLANT
PERCENT SHIPPED:	100		
DESTINATION FACILITY:	PORT	LOCATION:	EL AAIUN

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WORLD MINING. SEPT. 1973, P. 55.

WORLD MINING. NOV. 1975, P. 68.

WORLD MINING. MOROCCO, OCT. 1980.

ZIMBABWE

LOCATION AND GENERAL DEPOSIT INFORMATION

NATION: ZIMBABWE	SUBDIVISION: INYAZURA
TYPE OF OPERATION: SURFACE	CURRENT STATUS: PRODUCER
LATITUDE: S 19 DEG 02 MIN 00 SEC	LONGITUDE: E 31 DEG 45 MIN 00 SEC
UTM - ZONE: 36	NORTHING: 7895142 EASTING: 368453
HEMISPHERE: SOUTHERN	POINT OF REFERENCE: ORE BODY
POINT OF REFERENCE: ORE BODY	PRECISION: 1 KILOMETER
ELEVATION: 1250 METERS	PRECISION: 500 METERS
DATUM: SEA LEVEL	YEAR OF INFORMATION: 1981

OWNERSHIP	AFRICAN EXPLOSIVES AND CHEMICAL INDUSTRIES LTD. DOROWA MINERALS LTD.	STATUS	OWNER OPERATOR
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**COMMODITY** **MARKETABILITY**  
**PHOSPHATE** **PRIMARY PRODUCT**

PUBLISHED RESERVE-RESOURCE INFORMATION

UNDIFFERENTIATED UNITS	RECORD 1 37,100,000 MT ORE
YEAR/DATA	1980

IN SITU GRADE:		RECORD	ASSAY FORM	GRADE	UNIT
		1	P205	7.9	WT-PCT

**RESERVE-RESOURCE - REMARKS**

SOURCE FOR RECORD 1:  
BRITISH SULPHUR. WORLD SURVEY OF PHOSPHATE DEPOSITS. 4TH  
EDITION, LONDON, 1980.

**DEPOSIT HISTORICAL INFORMATION**

DISCOVERY METHOD: -----EXPLORATION METHODS-----  
ORE-MINERAL IN PLACE DRILLING  
YEAR OF DISCOVERY: 1938  
YEAR OF INITIAL PRODUCTION: 1965

## GEOLOGIC AND SPATIAL CHARACTERISTICS OF DEPOSIT

MODE OF ORIGIN: HYDROTHERMAL; MAGMATIC DIFFERENTIATION  
SHAPE OF ORE BODY: MASSIVE  
CONTROLLING FEATURES: IGNEOUS

#### MINERALIZED ZONE:

AVERAGE DEPTH: 0 METERS  
AVERAGE LENGTH: 2438 METERS  
AVERAGE THICKNESS: 200 METERS

MINIMUM DEPTH: 0 METERS  
AVERAGE WIDTH: 2350 METERS

## UNCONSOLIDATED MATERIAL:

AVERAGE THICKNESS: 6 METERS

## LITHOLOGY:

NAME OF FORMATION: DOROWA COMPLEX

GEOLOGIC AGE: TRIASSIC

DEFORMATION DESCRIPTION: INTRUSION

GEOLOGIC AGE: TRIASSIC

## ROCK TYPE:

CARBONATITE IS ORE; NEAR ORE

SYENITE IS ORE; NEAR ORE

GRANITE NEAR ORE

## MINERALIZATION:

MINERAL NAME MINERAL CLASS

AFATITE PHOSPHATES

MAGNETITE OXIDES (EXCLUDING SiO<sub>2</sub>)QUARTZ FORMS OF SiO<sub>2</sub>

FACOLINITE SILICATES

MINE/MILL INFORMATION

## SURFACE MINING:

METHOD: OPEN-PIT

UNITS: MT ORE/DAY

CAPACITY: 2900

## TRANSPORTATION (ORE):

ORIGINATING FACILITY: MINE

LOCATION: ZIMBABWE

LATITUDE: S 19 02 00

LONGITUDE: E 31 45 00

PERCENT SHIPPED: 100

METHOD OF TRANSPORTATION: SCRAPER

LOCATION: ZIMBABWE

DESTINATION FACILITY: MILL (ON-SITE)

LONGITUDE: E 31 45 00

LATITUDE: S 19 02 00

## BENEFICIATION:

METHOD: FLOTATION

----- DESCRIPTION OF MILLING -----

DESIGN CAPACITY: 2900

ORE/TUMBLING/SIZING/MAGNETIC SEPARATION/  
MILLING/DESLIMING/CONDITIONING/  
FLOTATION/DRYING

UNITS: MT ORE/DAY

PRODUCT	ASSAY FORM	RECOVERY	CONCENTRATE GRADE	UNIT
PHOSPHATE ROCK	F205	59	35	WT-PCT

## TRANSPORTATION FOR PRODUCT: PHOSPHATE ROCK

ORIGINATING FACILITY	LOCATION
MILL (ON-SITE)	ZIMBABWE
LATITUDE: S 19 02 00	LONGITUDE: E 31 45 00
PERCENT SHIPPED: 100	
METHOD OF TRANSPORTATION: TRUCK; RAIL	DISTANCE (KM): 40; 190
DESTINATION FACILITY: FERTILIZER PLANT	LOCATION: ZIMBABWE

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## APPENDIX A.--ALPHABETICAL LISTING OF ABSTRACTS BY DEPOSIT NAME

<u>Deposit name</u>	<u>Country or State</u>	<u>Page</u>
Abu Tartur	Egypt	501
Acrefoot Johnson	Florida	51
Akashat	Iraq	515
Al Borouj	Morocco	552
Anitapolis	Brazil	466
Arad	Israel	518
Araxa-Arafertil	Brazil	446
Araxa-Camig	Brazil	456
B. H. Griffin	Florida	53
Bayovar	Peru	578
Beckwith Hills	Wyoming	392
Ben Guerir	Morocco	559
Big Four	Florida	92
Blackfoot Bridge Site	Idaho	287
Bonny Lake Mine	Florida	166
Bou Craa	Western Sahara	663
Boyette II	Florida	90
Brooker-Dukes	Florida	13
C F Hardee Phosphate Complex	Florida	55
Caldwell Canyon Site	Idaho	270
Cargill	Canada	468
Catalao (Goiasfertil)	Brazil	440
Catalao-Fosfago	Brazil	443
Centennial Phosphate Mine	Idaho	291
Central Wasatch Range	Utah	347
Champ Lease	Idaho	241
Charleston Region Deposits	South Carolina	309
Chiliksay	U.S.S.R.	641
Christina Reserve	Florida	208
Christmas Island No. 1	Australia	419
Christmas Island No. 2	Australia	422
Clear Springs	Florida	178
Columbia County #1 Deposit	Florida	27
Conda Mine	Idaho	228
Cooks Hammock #1	Florida	116
Cooks Hammock #2	Florida	118
Coosawhatchee Region Deposits	South Carolina	307
Crawford Mountains	Utah	337
D Tree	Australia	432
D. E. Carlton	Florida	78
Dagbati	Togo	600
Daoui Nord	Morocco	554
Daoui-Recette 4	Morocco	545
David C. Turner Heirs	Florida	130
Deep Creek	Florida	19
Deseret Ranch	Florida	15
Desoto-Manatee Reserve	Florida	31
Diamond Creek Mine Site (Alumet)	Idaho	275
Djebel Onk	Algeria	414
Dorowa	Zimbabwe	666
Dry Valley Mine Site (FMC)	Idaho	279

<u>Deposit name</u>	<u>Country or State</u>	<u>Page</u>
Duchess	Australia	427
Durette Mine	Florida	126
Durrance/Waters Tract	Florida	62
East Pierce Deposit	Florida	114
Ein Yahav	Israel	526
El Hasa/El Abiad	Jordan	528
Emei	China	481
Esh-Shidiyah	Jordan	534
Fanshan	China	470
Farmland Hardee Mine	Florida	49
Farmland Hillsborough Reserve	Florida	102
Farmland/Ona Area-Small Ownership	Florida	80
First Mississippi Chemical Tract	Florida	100
Flaming Gorge	Utah	327
Florida Agglite Debris Plant	Florida	98
Fort Green Mine	Florida	155
Fort Meade Mine (Gardinier)	Florida	200
Fort Meade Mine (Mobil)	Florida	186
Four Corners	Florida	124
Freeport Area Small Ownerships	Florida	76
Fridovich	Florida	206
Fuzhuan	China	477
Gaiyang	China	475
Gay Mine	Idaho	224
Gros Ventre Range	Wyoming	404
Gunming	China	489
Gunyang	China	486
Hahatoe/Kpogame	Togo	602
Hamilton County Reconnaissance	Florida	45
Hamrawein	Egypt	494
Hard Rock Deposit	Florida	150
Hardee Mine	Florida	58
Hardee West Prospect	Florida	64
Hardrock Deposit	Florida	17
Haynsworth Mine	Florida	163
Hazara	Pakistan	576
Henry Mine	Idaho	245
Hillsborough Co.-Farmland/Brewster	Florida	104
Hoback Range	Wyoming	409
Hooker Chemical Properties	Tennessee	311
Hookers Prairie Mine	Florida	169
Hopewell Mine	Florida	110
Horse Creek	Florida	60
Horse Creek, D.E. Carlton	Florida	35
Hunt Brothers Ranch	Florida	106
Husky No. 1 Lease	Idaho	283
Ipanema I & II	Brazil	461
Itataia	Brazil	438
Jacupiranga	Brazil	463
Jhamarkotra	India	512
Jin-Ho	China	483
Jingbing	China	485
Jingshan	China	473

<u>Deposit name</u>	<u>Country or State</u>	<u>Page</u>
Kalaa Khasba	Tunisia	605
Kara Tau Deposits	U.S.S.R.	638
Kef Eschfair	Tunisia	609
Keys Property	Florida	128
Khouribga Underground	Morocco	547
Kingisepp	U.S.S.R.	649
Kingsford Mine	Florida	175
Kirov Mine (Kukisvumchor-sk)	U.S.S.R.	652
Kneifess	Syria	597
Koashva	U.S.S.R.	625
Kovdor	U.S.S.R.	644
La Crosse Deposit	Florida	9
Lacunga River	Angola	417
Lady Annie/Lady Jane	Australia	430
Lake County Deposit	Florida	120
Lakes Deposit	Florida	7
Lee Creek Mine	North Carolina	302
Limestone Land Company	Florida	66
Lithia-Boyette	Florida	112
Little Payne Creek	Florida	195
Live Oak Deposit	Florida	216
Lonesome Mine	Florida	95
M'Dilla	Tunisia	612
M. C. West Properties	Tennessee	321
Manatee North	Florida	136
Manatee South	Florida	140
Manson-Jenkins	Florida	68
Maybe Canyon Mine	Idaho	237
Mazidag	Turkey	622
Mcalpin Deposit	Florida	218
Meraa El Arech	Morocco	543
Meskala District	Morocco	562
Metlaoui	Tunisia	607
Mobil Area	Florida	84
Mobil Chemical Company	Tennessee	316
Molodezhnyy (Rasvumchorr)	U.S.S.R.	633
Monsanto Properties	Tennessee	324
Moscow Region	U.S.S.R.	631
Moulares/M'Rata	Tunisia	616
Mountain Fuel Lease	Idaho	233
Nahal Zin	Israel	523
Nauru Island	Nauru	573
Nichols Mine	Florida	181
Noralyn/Phosphoria Mine	Florida	172
North Baker County Deposit	Florida	11
North Carolina Phosphate Corp.	North Carolina	298
North Columbia County #2	Florida	23
North Columbia Deposit	Florida	29
North Henry Mine	Idaho	266
North Lake City Deposit	Florida	21
Northeast Manatee Swift/Grace	Florida	144
Northeast Manatee-Altman Tract	Florida	134
Northeast Manatee/Texaco	Florida	148

<u>Deposit name</u>	<u>Country or State</u>	<u>Page</u>
Northern Deposits	Australia	434
Northern Wasatch Range	Utah	342
Olinda-Paulista/Igarassu	Brazil	459
Olliff Option	Florida	74
Oron	Israel	521
Osceola National Forest	Florida	25
Oshurkov	U.S.S.R.	636
Palabora	South Africa	590
Pallo (Thies)	Senegal	584
Pamlico River Deposit	North Carolina	305
Patos De Minas	Brazil	452
Payne Creek-Palmetto	Florida	152
Pesca	Colombia	491
Pierce-Pebbledale	Florida	161
Pine Level Deposit	Florida	33
Pirkle Deposit 1	Florida	5
Polk County Mine	Florida	203
Pungo River Deposit	North Carolina	300
Qena	Egypt	505
Quseir	Egypt	497
Rasmussen Ridge Mine Site (Stauffer)	Idaho	253
Redeyef	Tunisia	614
Relyea Mine	Montana	293
Riecito	Venezuela	660
Rockland Mine	Florida	197
Ruseifa	Jordan	531
Rutland-Colvin-Vale	Florida	132
Saddle Creek-Ebersbach	Florida	158
Safaga	Egypt	499
Salt River Range	Wyoming	379
San Hilario	Mexico	538
San Juan De La Costa	Mexico	540
Santa Domingo	Mexico	536
Sarasota County Deposit No. 1	Florida	212
Sarasota County Deposit No. 2	Florida	214
Savannah Deposit	Georgia	220
Sebaiya West	Egypt	503
Sehib	Tunisia	619
Seligdar	U.S.S.R.	658
Shandong	China	479
Sharp Property	Florida	88
Sharkya (A&B)	Syria	593
Sherrin Creek/Lily Creek	Australia	436
Sidi Hajjaj	Morocco	550
Siilinjarvi	Finland	507
Silver City Mine	Florida	192
Smoky Canyon Lease	Idaho	257
Snake River Range	Wyoming	373
Sokli	Finland	510
South Fort Meade Mine	Florida	184
South Hardee	Florida	86
South Ridges	Wyoming	395
Southeast Wind River Range	Wyoming	367

<u>Deposit name</u>	<u>Country or State</u>	<u>Page</u>
Southern Khouribga Region	Morocco	557
Southern Wasatch Range	Utah	362
St. John's County Deposit	Florida	210
Stanaland Ranch	Florida	108
Statenville Deposit	Georgia	222
Stauffer Chemical Co. Properties	Tennessee	318
Sublette Range	Wyoming	399
Suwannee River Mine	Florida	39
Swift Creek Mine	Florida	42
Swift/Durrance Area	Florida	146
Taiba	Senegal	587
Tapira (Valep)	Brazil	449
Tarag El Hbari	Syria	595
Tennessee Valley Authority Reserves	Tennessee	314
Texaco Manatee	Florida	138
Trail Creek Lease	Idaho	262
Tsentralanyy	U.S.S.R.	628
Tump Range	Wyoming	388
Turayf	Saudi Arabia	582
Turner Property	Florida	142
Vernal Field	Utah	356
Vernal Mine	Utah	352
Viatka-Kama	U.S.S.R.	647
W. Bethel and Adjacent Deposits	Florida	37
Warm Springs Creek Phosphate Mine	Montana	295
Waters Tract	Florida	70
Watson Mine	Florida	189
West Thaniyat	Saudi Arabia	580
Western Uinta Range	Utah	332
White Springs Deposit	Florida	47
Wingate Creek	Florida	122
Wonarah	Australia	425
Wooley Valley Mine	Idaho	249
Wyoming Range	Wyoming	384
Youssoufia Black Rock	Morocco	567
Youssoufia Open Cast	Morocco	570
Youssoufia White Rock	Morocco	564
Yukspor	U.S.S.R.	655
Zhongkiang	China	471
Zolfo/Stauffer	Florida	82
Zolfo Springs Area Small Ownerships	Florida	72

APPENDIX B.--LISTING OF ABSTRACT DATA SETS, SUBSETS, AND DATA ELEMENTS<sup>1</sup>

## 1. Location and general deposit information

General information and location	Point of reference--Continued
Deposit name	Claim
Sequence number	Plant
State or nation	Town
County or political subdivision	Precision
Type of operation	Elevation
Surface	Precision
Underground	Datum
Surface-underground	Year of information
Prospect	Type of mineral holding
Mineral location	Located claim
Unknown	Patented claim
Current status	Federal lease
Producer	State lease
Past producer	Private lease
Temporary shutdown	Fee ownership
Developing deposit [on-line]	Minerals only
Explored deposit [quantified reserves]	Other--free-form entry
Raw prospect [little or no exploration]	Alternate names
Latitude	Ownership
Longitude	Status
Universal Transverse Mercator--UTM	Commodity
Zone	Modifier
Hemisphere	Marketability
Northing	Primary product
Easting	Coproduct
Point of reference	Byproduct
Main entry	Recoverable [potential plant byproduct]
Trench	Affect marketability [fertilizer manufacturing contaminant]
Ore body	

## 2. Published reserve and resource information

Published information	Year of data
Measured	Record
Indicated	In situ grade
Demonstrated [cumulated tonnage of measured and indicated reserves]	Assay form
Inferred	Grade
Undifferentiated [not categorized]	Unit
Units	wt-pct
mt ore	Reserve and resource remarks
	Source for records

<sup>1</sup>Information in brackets defines usages particular to this directory.

### 3. Deposit historical information

General information	Exploration methods
Discovery method	Year of discovery
Ore mineral in place	Year of initial production
Ore mineral not in place	Year of final production
Auxiliary mineral in place	
Auxiliary mineral not in place	
Geophysical anomaly	
Geological inference	

### 4. Geologic and spatial characteristics of deposit

General information	Unconsolidated material
Type of ore body	Average thickness
Disseminated	Minimum thickness
Placer	Lithology
Sedimentary	Name of formation
Other--free-form entry	Geologic age
Mode of origin	Deformation description
Hydrothermal	Minor folding
Contact metasomatic	Faulting
Magmatic differentiation	Major faulting
Sedimentation	Metamorphism
Residual concentration	Intrusion
Replacement	Other--free-form entry
Other--free-form entry	None
Shape of ore body	Relationship to mineralization
Tabular	Mineralization preceding deformation
Lenticular	Mineralization during deformation
Massive	Mineralization preceding and during deformation
Irregular	Mineralization following deformation
Controlling features	Mineralization during and following deformation
Folding	Mineralization preceding, during, and following deformation
Faulting	Complex
Igneous	Geologic age
Bedding	Rock type (name of rock)
Lithology	Ore in fractures
Other--free-form entry	Lies along ore
Degree of wallrock alteration	Lies over ore
None	Lies under ore
Slight	Replaced by ore
Moderate	Encloses ore
Intense	Gangue
Mineralized zone	Is ore
Average depth	
Minimum depth	
Average length	
Average width	
Average thickness	
Strike and/or dip	

Mineralization  
 Mineral name  
 Mineral class  
 Silicates  
 Sulfides  
 Sulfosalts  
 Oxides, excluding SiO<sub>2</sub>  
 Carbonates  
 Sulfates and chromates  
 Phosphates

Grain size  
 Aphanitic  
 Phaneritic--fine  
 Phaneritic--medium  
 Phaneritic--coarse  
 Pegmatitic  
 Variable

## 5. Mine and mill information

### Surface mining

Method  
 Open pit  
 Strip--hillside  
 Stripping  
 Bench (berm)  
 Quarry  
 Glory hole  
 Alluvial mining  
 Hydraulicking  
 Dredging  
 Nonfloating plant

Capacity  
 Units

mt ore/day

### Description of cover

Sand, silt  
 Quicksand [wet unconsolidated sediments]  
 Sand, gravel  
 Hardpan  
 Medium-hard rocks

Hard rocks

### Hardness of ore

Sand, silt  
 Quicksand [wet unconsolidated sediments]  
 Sand, gravel  
 Hardpan  
 Medium-hard rocks

Hard rocks

### Average cover thickness

### Surface area

### Percent waste rock

### Slope of pit [highwall angle]

### Bench height

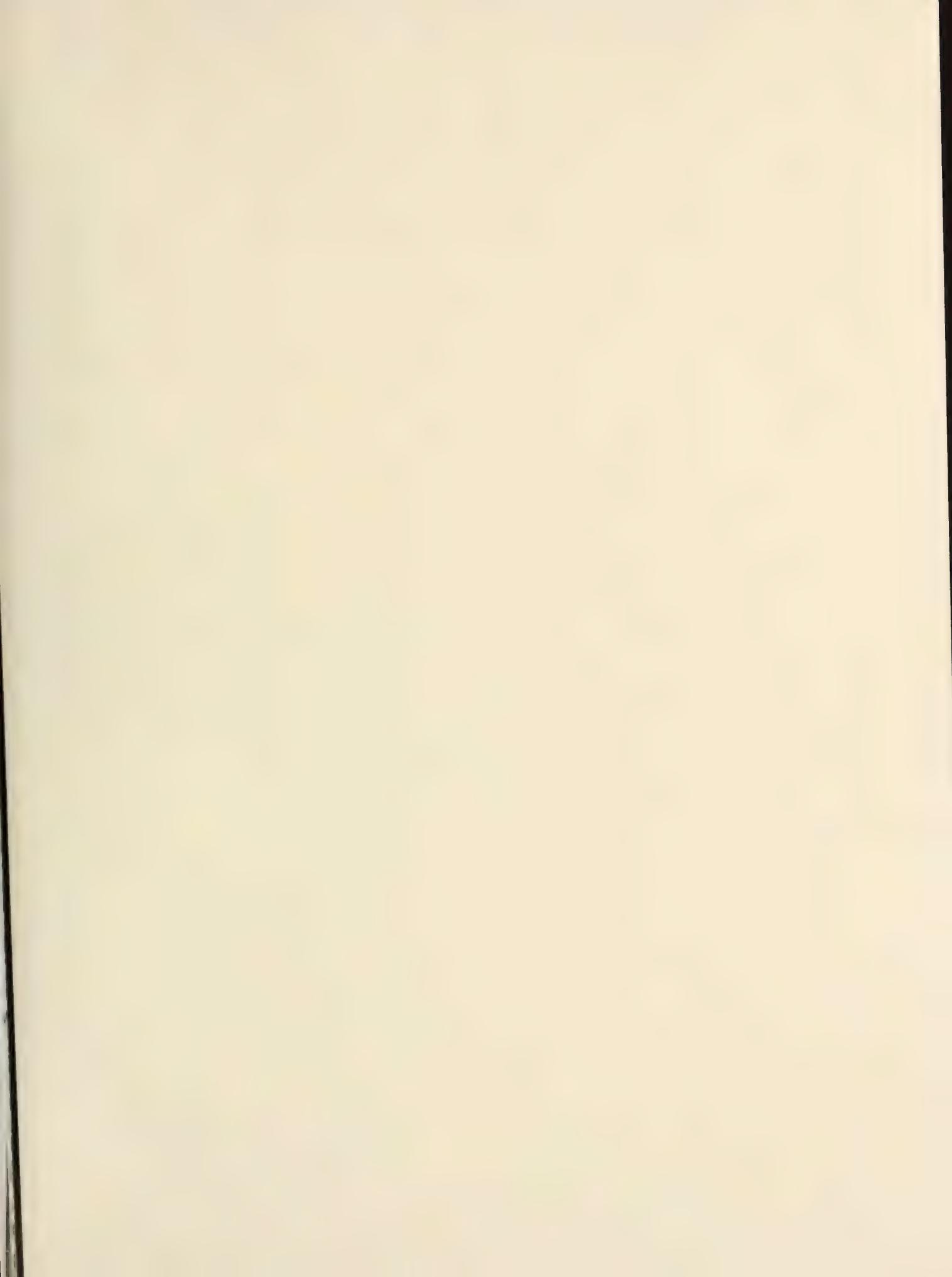
### Underground mining

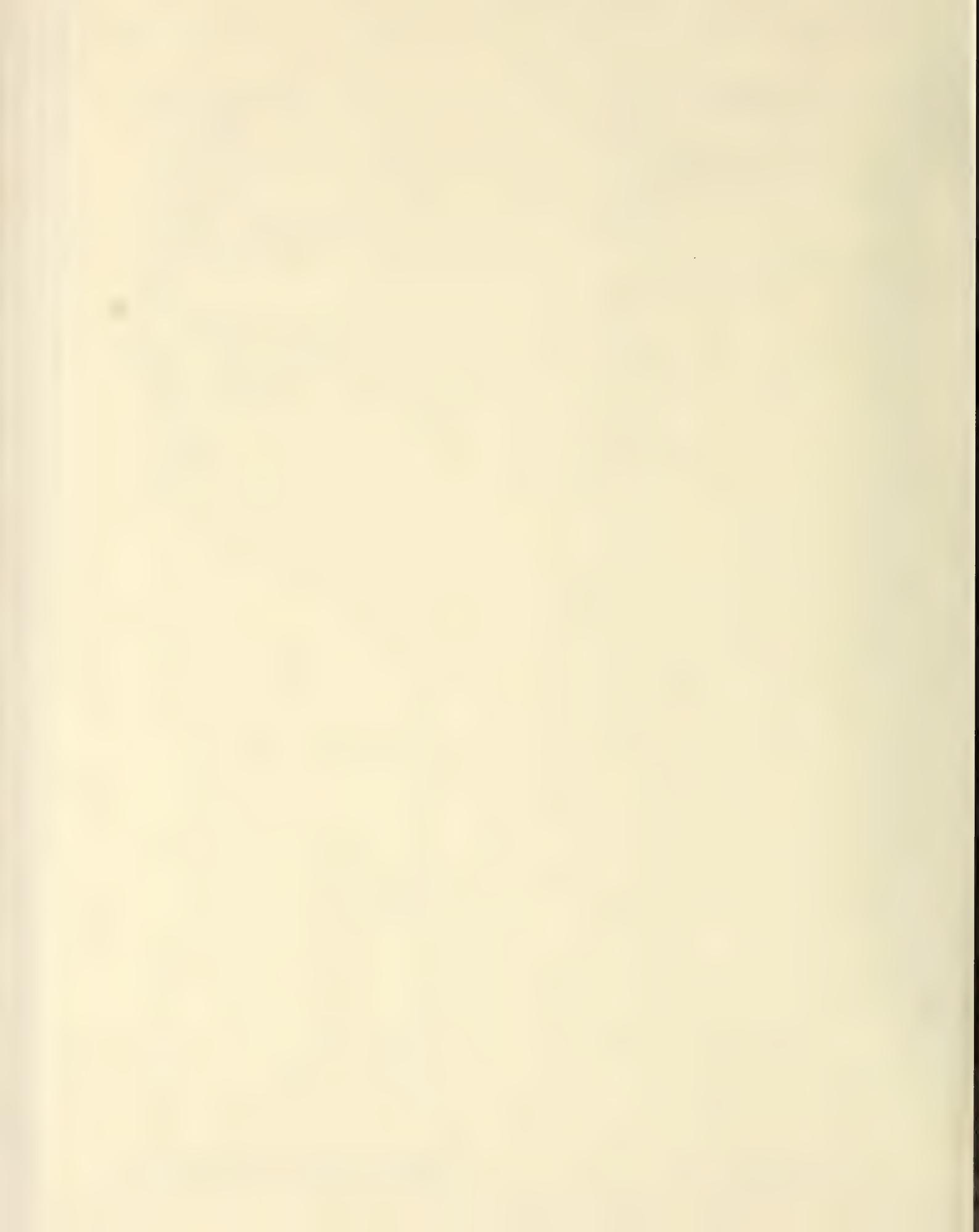
Method  
 Open stope  
 Gophering [coyoting]  
 Breast stoping  
 Room and pillar  
 Underhand  
 Glory hole  
 Overhand  
 Pillar and chamber  
 Sublevel  
 Other open-stope methods  
 Timbered stopes  
 Overhand square-set  
 Underhand square-set  
 Horizontal square-set  
 Other timbered stopes  
 Filled stopes  
 Timber with subsequent fill  
 Horizontal cut and fill with waste rock  
 Horizontal cut and fill with tailings  
 Resuing  
 Ascending crosscuts  
 Descending crosscuts  
 Inclined cut and fill  
 Other filled-stope methods  
 Caving methods  
 Top slicing  
 Inclined top slicing  
 Sublevel caving  
 Longwall caving  
 Other caving methods  
 Shrinkage methods  
 Other shrinkage methods

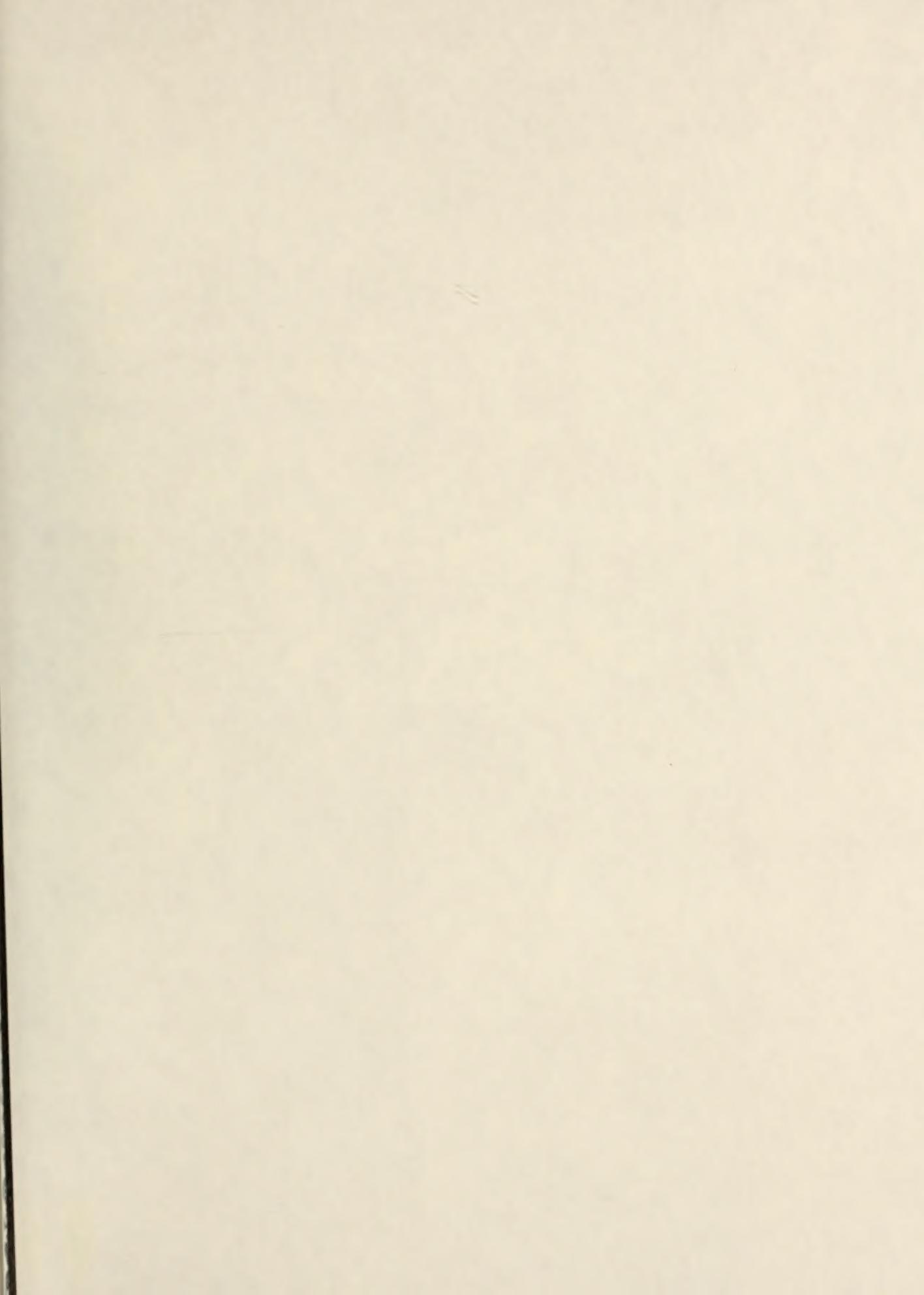
Method--Continued	Conditions of workings
Combined methods	Caved at portal
Shrinkage with caving	Flooded
Shrinkage with timbered methods	Bad air
Shrinkage with cut and fill	Open
Timbered stopes with caving methods	Plugged
Caving methods with timbered	Sealed
methods	No mine entry
Auger mining	Partly accessible
Solution mining	Total length of workings
Frasch process	Shafts--number
Capacity	Average depth
Units	Inclines--number
mt ore/day	Average length of inclines
Rock and water conditions	Slopes of inclines
Hardrock with little water	Adits--number
Hardrock fissured with moderate	Average length
water	Transportation (ore)
Hardrock fissured with excessive	Originating facility
water	Mine
Soft nonplastic with little water	Location
Soft nonplastic fissured with	Latitude
moderate water	Longitude
Soft nonplastic fissured with	Percent shipped
excessive water	Method of transportation
Soft semiplastic with little water	Truck
Noncoherent with little water	Rail
Noncoherent with excessive water	Pipeline
Characteristic of rock	Conveyor
No planes of weakness	Ocean
One system of weakness planes	Lake
Multiple systems of weakness planes	Air
Noncoherent	River
Semiplastic or plastic	Other--free-form entry
Rock and mine support	Distance
Supporting	Destination facility
Supporting when dry	F.o.b. mine
Supporting--may back slab	Port
Unsupporting--no flow	Mill (onsite)
Unsupporting--no slough	Mill (offsite)
Unsupporting--may slough	Refinery
Completely incompetent	Market
Other--free-form entry	Location
Timber	Latitude
Chemical coating	Longitude
Post, headboard, caps. roof bolts	Beneficiation
Timber with lagging concrete--	Method
unreinforced	Handsort
Open steel sets	Sizing
Steel with lagging concrete--	Washing
reinforced	Gravity
Can't support; fill or cave	Jig

Method--Continued	Method of transportation
Classifier	Truck
Heavy media	Rail
Flotation	Conveyor
Hydrometallurgy unspecified	Pipeline
Magnetic	Ocean
Electrostatic	Lake
Magnetic and electrostatic	River
Pyrometallurgy	Other--free-form entry
Design capacity	Distance
Units	Destination facility
mt ore/day	F.o.b. mill
Description of milling	Port
Transportation for product	Market
Originating facility	Refinery
Mill (onsite)	Other
Mill (offsite)	Location
Location	Latitude
Latitude	Longitude
Longitude	
Percent shipped	

## 6. Bibliographic records











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